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Designing High-Pressure Steel Valves

Use of Cast-Iron Valve Patterns Condemned—Proper Metal Distribution Essential—Scientific Investigation Recommended

BY E. G. GREENMAN

There is an inclination on the part of valve manufacturers to use the patterns which were made for iron valves for pressures of from 175 to 250 lb. of steam for making steel valves for the same or somewhat higher pressures and the practice is open to several objections from the users' standpoint and is probably preventing, at least to a certain extent, the use of steel valves in places where they could be used to good advantage.

The primary reason for this pattern makeshift is a desire to economize and as such is worthy up to a certain point, but unfortunately the economy benefits the manufacturer only, and it is a short-sighted economy at that. Some valve manufacturers cast steel valves in their own foundry in or near their cast-iron foundry, or buy the castings in their immediate vicinity, while others must send the patterns out to some distance. There is evident economy, temporarily at least, in the first case in using the same patterns even though shrinkage and finish allowance may have to be taken care of by some changes in the original patterns which were made for cast-iron valves. In the second case the economy in using the same or similar patterns is not so evident as few manufacturers could spare the patterns from their cast-iron foundry long enough to get the necessary steel castings without delaying cast-iron valve orders, and the difficulty is made worse from the fact that it is somewhat more difficult to secure tight castings of steel and consequently the patterns may need to be left in the steel foundry until the castings are partially finished so that there may be reasonable assurance that no serious flaws will be found. Comparatively few steel valves are used at present and therefore it often does not pay to make up enough extra castings to take care of possible losses which cannot be detected previous to finishing. But even if this condition makes it necessary to have two sets of patterns for steel and cast-iron valves, the manufacturer may still consider it expedient to make a set for the steel valves which is a duplicate of his cast-iron valve patterns. His reason for such a course is obvious as certain sizes may be made in metal from the same master patterns and all sizes may be made from the same drawings and in case of emergency the patterns may be used interchangeably for iron or steel.

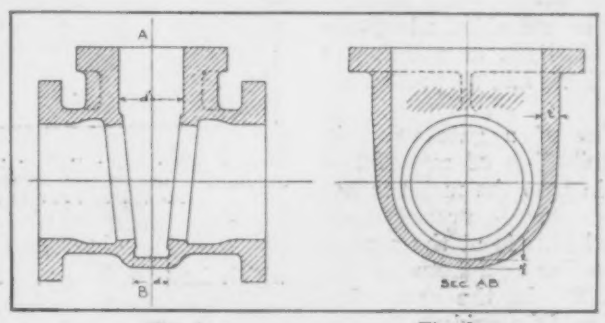


Fig. 1. Fig. 2.

Sections to Indicate Unappreciated Features of Valve Design

Consider the objections to using the same or a duplicate set of patterns for the two types of valves, no matter what is the apparent justification for such a course. In the first place there is the question of the cost of the valves to the customer. There is no denying that it will cost money to lay out new designs for steel valves and the manufacturer who could get along with one set of patterns for the two valves will be put to the additional expense of getting out a set of patterns for such sizes as he has a demand for in steel but possibly a saving of material sufficient to pay this expense within a reasonable length of time can be effected with no reduction in the utility of the product. Is there not possibly an objection to the use of such a heavy pattern for steel valves, or if there is no actual objection other than would apply equally to cast iron, is advantage being taken of the additional strength of the material to as great an extent as possible? The steel used for valves will run from four to five times as strong as cast iron in tension, and the material is so much more secure against failure from shocks such as are produced by water hammer, and from such piping strains as are caused by weight and by expansion and contraction, that a much smaller factor of safety may be used and as to stresses due to transverse strains, although there is not so much difference in the ultimate resistance of the two materials, the steel will deflect just about one half as much under the same stress and as the most frequent failure in satisfactory service of valves is by leakage due to distortion, this fact may be taken advantage of in determining the proportions of the various parts. Such distortions are usually caused by one of two things; they are either due to strains caused by tightening the disc against the seat, or by strains caused by such external forces as expansion and contraction, or weight of adjacent parts. The latter strains are closely related to the weight of the

valves themselves and a saving in material by making the valve bodies thinner has the additional advantage of reducing the external forces tending to cause failure, for very often a pipe line is made up of a series of valves with fittings or short pieces of pipe between them. There is another very great advantage in this reduced weight which is that the stresses in the overhead framework of the building, due to the weight of the suspended pipe line, are very greatly reduced and as such framework is ordinarily not designed to carry any considerable weight this is a decided point in favor of lighter valves and fittings.

Considering now some of the methods of designing steel valve bodies to secure the greatest advantage from the material employed, it may be stated that a cast-iron valve for heavy pressure is usually of about uniform metal thickness throughout, and it is a pretty clumsy affair. In designing a steel valve there is not the fear of failure occurring with the other material and rational principles may be applied. It is the writer's purpose to mention only two points at which metal may be saved to advantage. One is in the necks of the valve. These are usually made heavy because they are adjacent to heavy end flanges whose thicknesses at present follow the extra heavy iron standard. It is to be hoped that a lighter standard of thickness may shortly be adopted by progressive manufacturers, thus avoiding the necessity of making a valve heavier throughout than is necessary for strength or stiffness simply to accommodate it to a standard flange. But the flange is not entirely to be blamed for heavy valve necks for there is an apparent opinion that they should be heavy to give the body stiffness. That idea the writer wishes to oppose for the neck is an unimportant part of the body and distortion here is unimportant, while in the case of steel valves where there is little danger of fracture, it may be a decided advantage to make an unimportant part light on purpose so that distortion may occur there and so protect the working parts.

There is another section of a gate valve in particular where poor distribution of material is a disadvantage, especially in case the metal is not very much heavier than necessary to prevent leakage due to deformation, and that is at the section at right angles to the pipe line and between the seating surfaces, see Fig. 2. In the case of a wedge disc gate valve it should be evident that as the distance across the top of the wedge is greater than that across the bottom, the thickness of the metal in the body which opposes the thrust of the wedge against the seats should be in the same ratio. If the minimum thickness necessary to hold the valve tight at the bottom is determined, the metal should be gradually increased in thickness up around the sides to a point opposite the top of the wedge, in proportion as the length of the portion of metal that resists the thrust increases. Since the stretch of the metal at any section is directly proportional to its length and inversely as its thickness, the distance across the wedge at the bottom divided by the thickness of the metal at the bottom should equal the distance at the top divided by the thickness at the top, i.e. $\frac{d}{t} = \frac{d'}{t'}$. This would only be true in case other conditions were uniform, but such is not the case, for at the top not only is the distance greater but the thrust of the disc is not resisted by a direct or even a fairly direct pull in the material, and these forces must be transmitted by a flat surface which is subject to flexure. This flat surface, indicated by shading in Fig. 2, should be one of the thickest points in the valve body and it should be stiffened by ribs on the outside, and due to its weakness the thickness t' of the metal connecting the two opposite faces of the seat at the large end of the wedge should be thicker than determined by the proportional lengths if possible.

Scientific principles have rarely been applied to valve design in the past, but with the high temperatures and pressures now in more general use the time is ripe for engineers to enter this field where they will find plenty of problems requiring extended and careful studq.

A 6-In. Rotary Cutting Off Machine

The Newton Machine Tool Works, Inc., Twenty-third and Vine Streets, Philadelphia, Pa., has brought out a high duty 6-in. rotary cutting off machine. It is designed especially for use in connection with the manufacture of high explosive shells which have to be parted to provide for a fracture test. The hourly capacity of the machine is twenty pieces of 0.50 per cent carbon steel 6 in. in diameter.

A 6-In. High Duty Rotary Cutting-Off Machine for Use in Connection with High Explosive Shells Which Have to be Parted to Provide for the Fracture Test

Two systems are used in making shells for the fracture test with this machine. In one the bar is fed forward by stock handling apparatus at the rear of the machine, which is not shown, the apparatus being controlled from the operator's position. The other method is to cut the bars into double lengths on the builder's cold saw cutting off machine and then place the double length bar in the machine illustrated and part it for the fracture test. This procedure does not require the use of the stock handling apparatus and gives very rapid production on account of the speed with which the bars are turned out by the cold saw cutting off machine. The ends cut off on the saw form the top or open end of the shell, the fracture test being only required on the bottom.

The double cutting off slide has an adjustable automatic stop for varying lengths of work and three changes of feed. It is arranged to take tools measuring $\frac{3}{8}$ x $2\frac{1}{2}$ in., which are staggered to break the cut and arranged so that flat steel can be used, tool clearance being provided in the machine. A pump and attachment for lubrication are included in the equipment. The lubricant is sep-

arated from the chips and the latter are thrown into a tote box through the opening in the front of the base.

The machine is driven by a 10-hp. adjustable-speed alternating current motor. Where a direct current motor is used, a unit of the accelerating type is employed.

MAKING ROLLER BEARINGS

Methods Followed in American Roller Bearing Works, Pittsburgh

The American Roller Bearing Company, Pittsburgh, Pa., recently placed its new factory in operation for the production of anti-friction non-lubricant roller bearings for shafting machinery and for heavy duty generally. The bearing operates without lubrication. It consists of heavy-wall cold-drawn steel tubing for the sleeves and chrome tool steel for the rollers.

The cold-drawn steel tubing for the inner and outer sleeves of the bearing is received in mill lengths and cut into standard sizes by high-speed saws of special design. The rough tubing for both the inner and outer sleeves is machined inside and out on turret lathes. The races or tracks on the inner sleeves are shown among the accompanying illustrations. After machining, the sleeves are transferred to the heat treating department for hardening. The heat treating department is equipped with Tate-Jones furnaces, burning natural gas under pressure with the necessary drawing tanks.

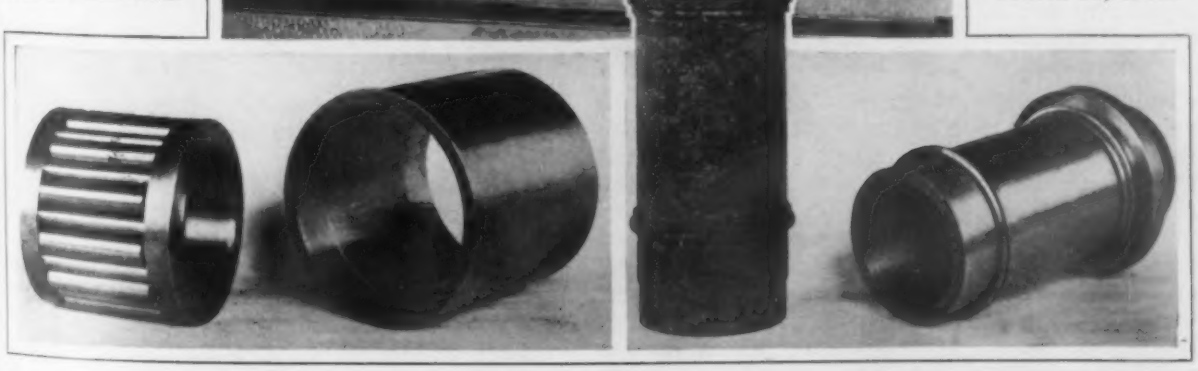
After inspection for flaws, the sleeves are sent to the grinding department for finishing both inside and out. The internal grinding is done on grinders of special design. Two of the smaller illustrations show an inner sleeve before and after the grinding operation. The sleeve shown to the extreme right is partly assembled, one of the two roller-retaining collars being pressed into position. For outside grinding the sleeves are set up on special mandrel tools shown in the larger view. This fixture is designed to allow a quick set up, and a minimum delay in removing a finished sleeve from the mandrel.

Alloy tool steel for both the load rollers and spacing rollers of the bearing, which has been described in these columns, is cut from bar lengths to the required sizes on automatic screw machines, adjusted for the length of roller. Each roller is inspected for defects before and after being hardened and is then tested for hardness and toughness and finally sent to the grinding department for finishing. The design of the bearing demands close observance of dimensions, and much of the grinding and turning equipment is of special design to insure permanent accuracy.

Before going to the assembling department, the inner sleeves are fitted with the roller retaining collars. These collars, made of cold drawn steel tubing and heat treated, are put into position under pressure and keyed. The assembling operation is simple. The load and spacing rollers are fitted under the roller retaining collars on the inner sleeve, making the rollers and the inner sleeve a single unit, as indicated at the extreme left of the smaller views. This method of construction has proved of value when the bearings are used as in heavy truck wheels, as it is often necessary to mount the roller unit on the shaft or axle, and press the outer sleeve in the wheel hub or bearing housing.

Bearings for power transmission devices are furnished with outside sleeves of special designs to conform to line shaft hanger and pillow block designs, but bearings for machinery are supplied with plain sleeves, permitting them to be installed in equipment designed for plain bearings. When the bearings are so installed, no oil reservoirs or other lubricating devices are provided in the housings, as they operate, as stated, without the use of a lubricant. This is possible, it is held, by the elimination of sliding contact, the load-carrying rollers being separated, at all times, by the spacing rollers. The load-carrying rollers lie within the race or track on the inner sleeve, while the spacing rollers are longer and are supported by the race flanges and revolve in a direction opposite to that of the load rollers. The bearing provides that the inner sleeve surrounds the shaft or axle and takes the wear of the hardened rollers.

The bearing was described in THE IRON AGE of Dec. 12, 1912, and March 27, 1913.



From left to right are the assembled rollers of the bearing; the outer shell or sleeve; the machined inner sleeve; the inner sleeve with one of roller-retaining collars. Above is the rig for outside grinding

Importance of Annealing Steel Castings

German Tests Showing the Dependence of the Static and Dynamic Properties on Annealing Temperatures—Judging the Heat Treatment by the Fractured Test Piece

In a recent article in Stahl und Eisen, Dr. P. Oberhoffer of Breslau, Germany, brought together his results on the annealing of steel castings. He has previously published several papers on this subject, one of which was abstracted in THE IRON AGE, May 21, 1914, under the title, "Shock Tests and the Annealing of Steel." The composition of some of the steels worked on, arranged according to carbon percentage, is given in the table.

Table of the Composition of the Steels

No.	Carbon, per cent	Manganese, per cent	Sulphur, per cent	Phosphorus, per cent	Silicon, per cent
1	0.11	0.60	0.035	0.030	0.40
2	0.23	0.98	0.038	0.042	0.38
3	0.26	0.80	0.030	0.024	0.25
4	0.40	1.11	0.039	0.027	0.21
5	0.46	0.92	0.042	0.041	0.20
6	0.53	0.79	0.036	0.027	0.25
7	0.69	1.03	0.022	0.021	0.25
8	0.86	0.90	0.028	0.016	0.27
1-A	0.13	0.96	0.067	0.072	0.36
1-B	0.13	0.43	0.029	0.035	0.52

These steels were cast in blocks 250 x 250 x 600 mm. (9.84 x 9.84 x 23.62 in.). They were all free from visible blow holes or contraction cavities, nor could any considerable amount of segregation be determined. Test pieces were cut out cold and the steel thoroughly examined, both as cast and after annealing for six hours at the desired temperatures and cooling slowly.

The average values of the results of the various tests are given in tables in the original paper, and are also clearly shown in diagram form. Three of these diagrams are given here, the first showing the dependence of the tensile strength on the annealing temperature, Fig. 1; the second, the dependence of the elongation on the annealing temperature, Fig. 2, measured in 200 mm. (7.88 in.), and the third, results of shock tests, Fig. 3. This last diagram shows the great value of the shock test in testing steel castings, especially those with the lower carbon percentages, and all show the great influence of annealing at the proper temperature. A comparison of the different curves shows the amount of improvement, which varies from one material to another. Photomicrographs of No. 4 are given in the paper to show the change in structure that accompanies annealing.

A practical method often used for determining the success of annealing is the observation of the tensile test fracture. A fine structure shows with certainty that the proper temperature has been reached. Unfortunately this method is not always of value, especially with the lower carbons where the elongation and reduction of area are higher. In such steels unannealed samples often give very good elongation and reduction of area. There is, however, another simple method to indicate whether the proper temperature has been reached, which is illustrated in Figs. 4 and 5. These test pieces are from steel 1-B, with 0.13 per cent carbon, and both show very good ductility. Bar 1 was annealed at 800 deg. C., and bar 2 at 890 deg. C., the latter being the correct temperature for this steel. The rough surface of the first piece is clear evidence that it has been annealed below the proper temperature, and only with the reaching of this temperature is the surface completely smooth.

This appearance is less noticeable the lower the elongation and reduction of area, but in these cases the fracture is more crystalline, so that either fracture or the appearance of the surface will give a

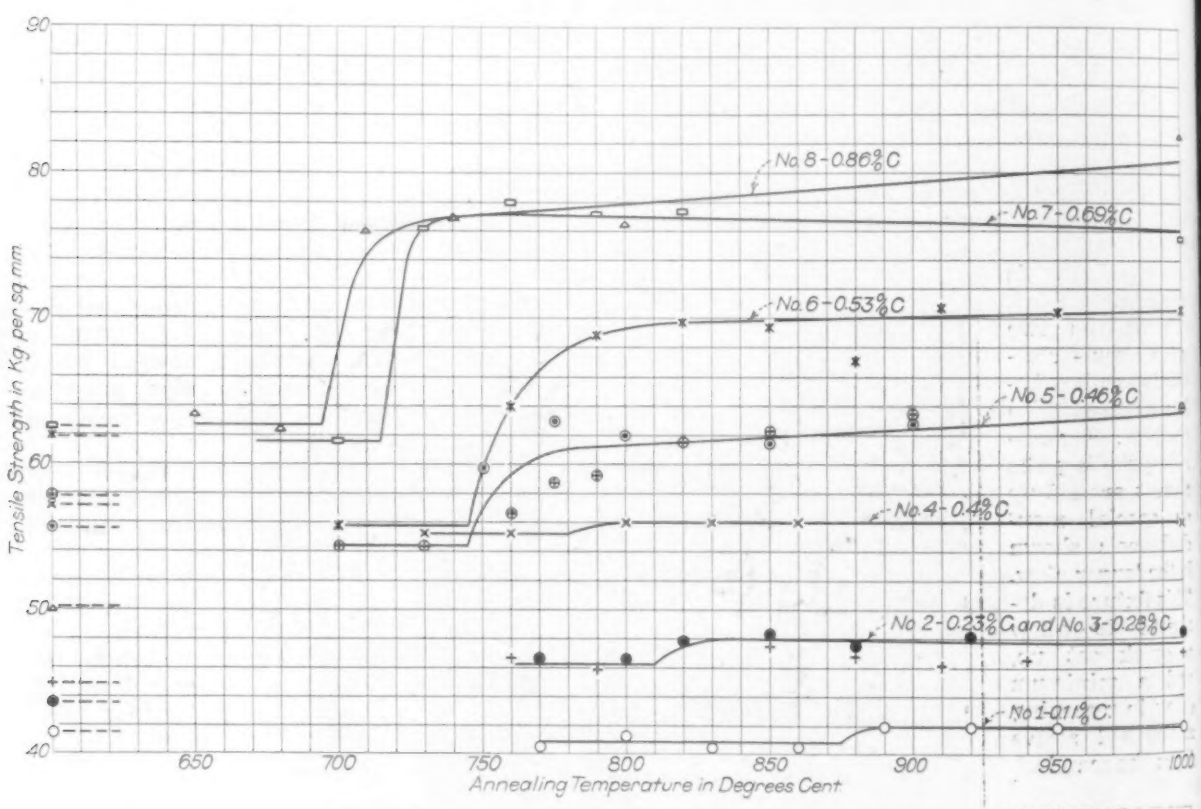


Fig. 1—Dependence of Tensile Strength on Annealing Temperature in Steel Castings

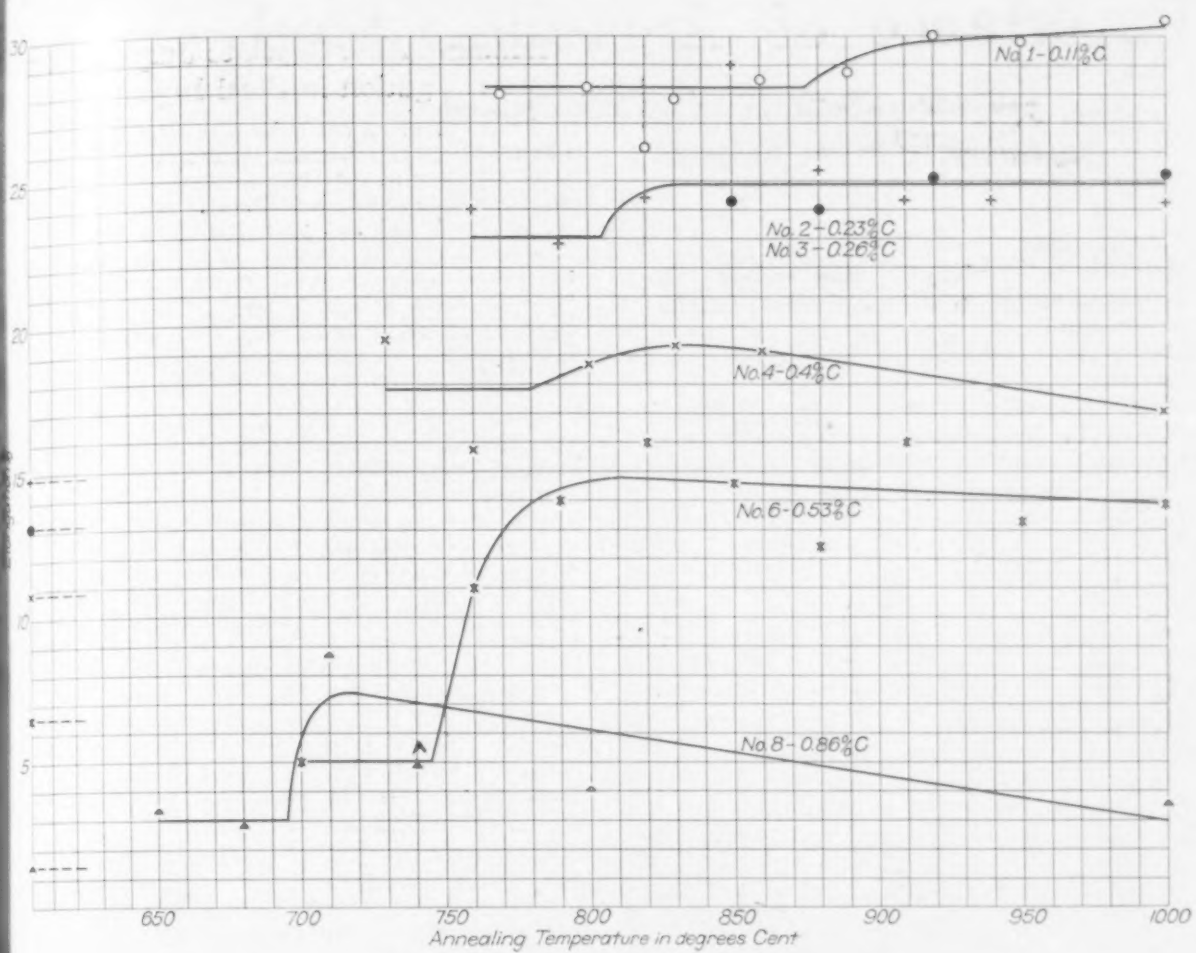


Fig. 2—Dependence of Elongation on Annealing Temperature in Steel Castings

ertain indication as to the annealing, especially with soft steels, when a microscope is not available.

In Fig. 6 the heavy firm line shows the best annealing temperature as determined by these experiments, and calculated for steels with 0.8 per cent mn. It should be remembered that exceeding these temperatures by a small amount, say 50 deg., is less harmful than the bad results caused by not reaching the proper temperature. The dotted line shows the beginning of ferrite separation according to Goerens and Meyer, for steels with 0.8 per cent mn. Very careful experiments were made with these steels and the thinner firm line shows the actual location of ferrite separation, the horizontal line, of course, being the pearlite. This is in much better agreement with the proper annealing temperatures than the dotted line. Fig. 7 shows the average results of ultimate stress, elongation, etc., in relation to the carbon of the steels after proper annealing. Notwithstanding the varying manganese the curves are smooth.

There was a short discussion of the paper, which mainly took up the difference in results found with steels 1 and 1-B. These steels were very similar in

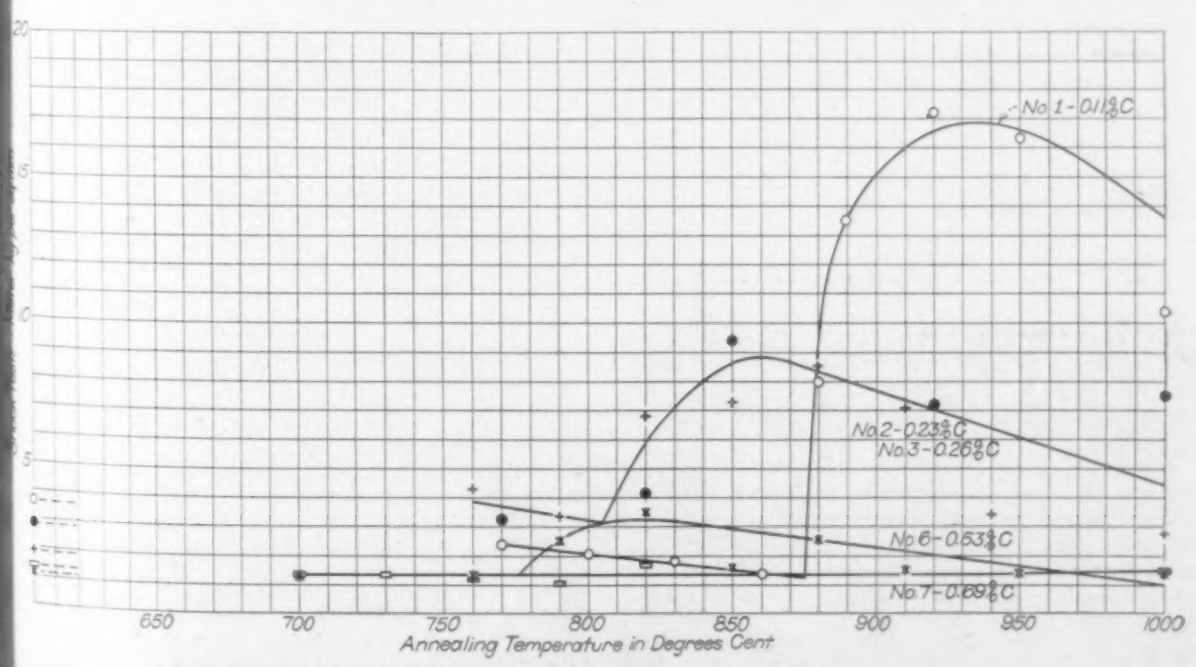


Fig. 3—Results of Shock Tests on Steel Castings

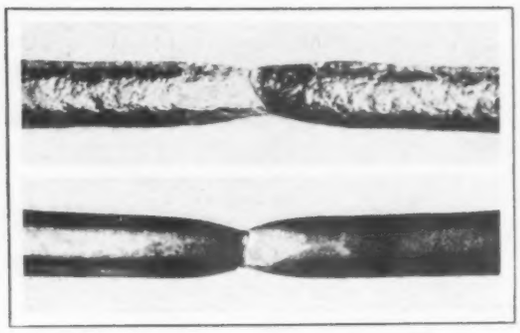


Fig. 4 (Upper) Shows the Surface of a Broken Tensile Test Bar of Under-Annealed Steel Castings. Fig. 5 (Lower) Shows the Smooth Surface of Properly Annealed Castings

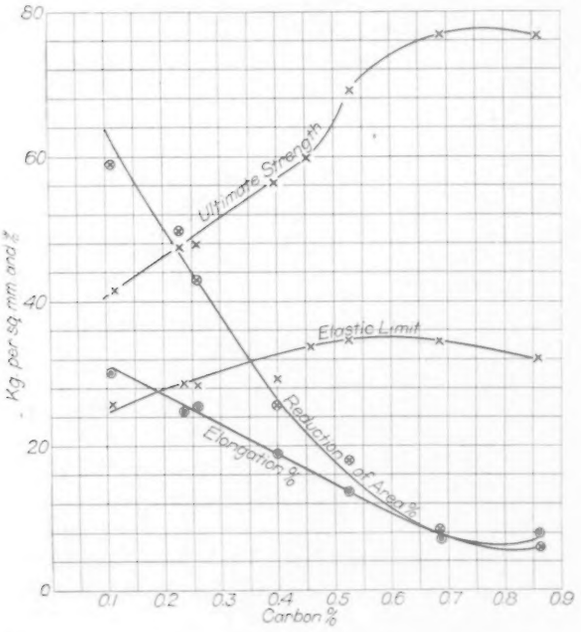


Fig. 6—Average Results in Relation to Carbon Percentage

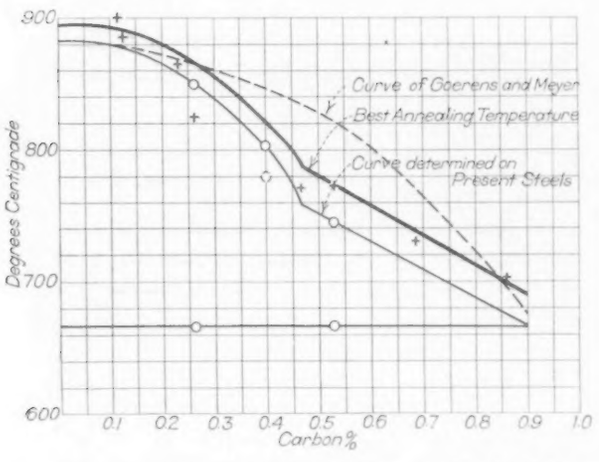


Fig. 7—Comparison of Ferrite Separation with Annealing Temperature

composition, but gave very different physical tests, and while the explanation was not fully settled upon, it was thought that it might be due to a difference in casting temperature, or because the blocks cast were of different size.

G. B. W.

The diagram showing when factory operation becomes unprofitable, printed on page 25 of THE IRON AGE of July 1, was not credited as it should have been to James A. White, works manager, of the Worcester Pressed Steel Company, Worcester, Mass., who submitted it in a discussion of the relation betwen production and costs at the recent meeting of the American Society of Mechanical Engineers at Buffalo, N. Y.

Aluminum As a Check to Sulphide Segregation in Steel Ingots

Forms in which sulphides may exist in steel ingots was a subject of discussion by Prof. J. O. Arnold and G. R. Bolsover at the annual meeting of the Iron and Steel Institute in London in May. In a paper on this subject, published last year, the authors said:

> It is a remarkable fact that the casts exhibiting more or less well-marked areas of the eutectic mixture all contained aluminum while those presenting no evidence of a eutectic contained no aluminum. These facts suggest that the very small amount of aluminum present plays some part either in forming the eutectic or in preserving the pattern of the fallen-out manganese sulphide by checking its segregation into relatively large masses.

The paper presented this year contains the results of experiments made to confirm, if possible, the authors' original suggestions. About 12 lb. of crucible cast No. 1499, weighing about 48 lb., was poured, without any addition of aluminum, into an iron mold 1¾ in. square. The remaining 36 lb., in a fluid state in the crucible, was put back into the furnace, and allowed to cool in a lump over night. Thus were obtained portions of identical steel quickly and slowly cooled. Drillings were taken near the top of the ingot and near the top and bottom of the lump, and on analysis showed the following composition:

Cast No. 1499	Carbon, Per Cent	Silicon, Per Cent	Manganese, Per Cent	Sulphur, Per Cent	Phosphorus, Per Cent	Aluminum, Per Cent
Ingot (near top)	0.26	0.075	1.11	0.517	0.021	Absent
Top of lump	0.26	0.084	1.07	0.534	0.021	
Bottom of lump	0.20	0.056	0.76	0.302	0.017	

The main segregations noted in the lump are 0.23 per cent sulphur and 0.31 per cent manganese. Both these segregations are doubtless largely due to a common cause, namely, the rising toward the top of the lump of MnS.

An ingot, No. 1461, which had been cast 1¾ in. square, after the addition of about 0.03 per cent of pure metallic aluminum, was analyzed for segregation on drillings taken from both the top and the bottom of the ingot. The following composition was shown:

Ingot No.	Size	Position	Carbon, Per Cent	Silicon, Per Cent	Manganese, Per Cent	Sulphur, Per Cent	Phosphorus, Per Cent	Aluminum, Per Cent
1461	1¾ in. sq.	top	0.27	0.167	0.74	0.424	0.019	trace
1461	1¾ in. sq.	bottom	0.28	0.158	0.78	0.478	0.018	trace

The above figures show that the aluminum has practically prevented any segregation. This curious and unexplained action of aluminum was, at the meeting of the Institute at Sheffield in 1905, proved by B. Talbot in an exhaustive and most valuable paper on "Segregation in Steel Ingots." The amount of aluminum employed by Mr. Talbot was very small, amounting to only about 0.007 per cent per ingot.

Of crucible cast No. 1540, weighing about 48 lb., 9 lb. was poured into a 1¾-in. square ingot, while the remaining 39 lb. was returned in the crucible to the furnace, and allowed to cool over night. To this cast about 0.05 per cent of metallic aluminum was added 5 min. before teeming the small ingot. The composition per cent of this ingot, and also of the top and bottom of the lump, are set forth in the following analyses:

Cast No. 1540	Carbon, Per Cent	Silicon, Per Cent	Manganese, Per Cent	Sulphur, Per Cent	Phosphorus, Per Cent	Aluminum, Per Cent
Top of ingot	0.30	0.163	1.02	0.493	0.02	0.01
Top of lump	0.30	0.163	1.02	0.493	0.021	0.01
Bottom of lump	0.26	0.187	1.02	0.480	0.021	0.01

The aluminum has virtually prevented any segregation in the very slowly cooled lump, whereas such segregation with reference to carbon, sulphur and manganese was well marked in the non-aluminum lump of cast 1499.

The contrast in the segregation of the manganese sulphide, as shown by very fine photomicrographs in the original paper, is remarkable. The authors regard it as additional testimony to the power of aluminum in retarding and checking sulphide segregations.

A 16-Ft. Four-Head Planing Machine

The Betts Machine Company, Wilmington, Del., has recently built a large planing machine with four heads. The machine, which will handle work 16 ft. wide, 10 ft. high and 30 ft. long, has been installed at the League Island Navy Yard, Philadelphia, Pa. Motor drive is employed and particular attention was paid to the means for obtaining rapid manipulation of all the moving parts.

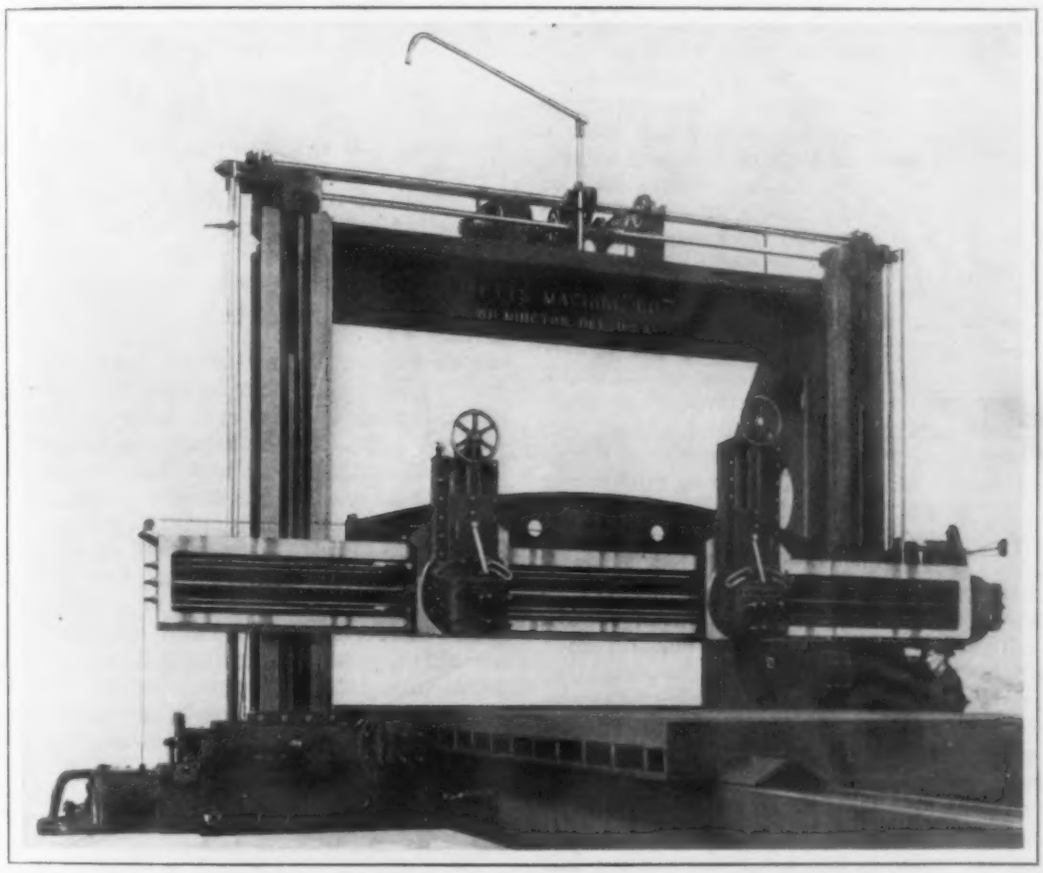
The bed has an over-all length of 55 ft. 4 in. Sectional construction was used, the various parts being reinforced by box cross-girts and fastened together with bolts and links. The top of the bed is made trough shaped to catch the dripping oil from the table rack and convey it to the central reservoir. One of the tracks on which the table slides is flat and the other V shaped, the angle of the latter being 120 deg.

The table, which is driven by a cut steel rack, is 32 ft. long and 11½ ft. wide. To facilitate shipping, this member, like the bed, was made in pieces, the two sections being fastened together by slotted links. It is of the builder's standard double-plate type with side openings to remove the chips which might fall through the stop holes in the top plate.

The uprights are keyed and bolted to the sides of the bed and are fastened together at the top by a heavy box section cross-girt. The uprights where they are bolted to the cheeks of the bed are 10 ft. deep and the face is 24 in. wide. The cross-rail is a box casting with a face width of 30 in. It is made long enough to permit either head to traverse the full distance between the uprights. An adjustable brace bolted to the top is provided which is relied upon to stiffen the cross-rail and take up the sag due to the combined weight of the rail and the heads. Screws operated through gearing from a 15-hp. motor located on the top of the machine raise and lower the cross-rail and power rapid traverse to the two tool heads mounted on the rail is provided by the same motor. Both inside and outside gibs are used to clamp the cross-rail to the face of the uprights. The tool heads are made right and left hand for close work and have vertical and angular adjustments of 48 in. and 36 in. respectively. The swiveling portion of the head is graduated and worm gearing enables it to be set over to any desired angle. The tool slides are of the square type and are held in place by adjustable gibs, taper shoes being provided for taking up wear. Both heads are provided with an automatic tool lifting device which is operated from the feed mechanism located at the right end of the cross-rail. The vertical or angular feed to the slides and the horizontal feed to the heads are controlled by the upper lever attached to each head. Automatic falling bearings are provided in the center of the cross-rail for supporting the weight of the saddle screws and splined shafts.

The other two heads of the machine are located one on each upright. They are of the builder's extension slide type, are counterweighted and have automatic feed up and down the uprights and a horizontal angular hand feed. Power for the automatic feeds is taken from two positive, quick acting feed boxes, one for each head, the weight being varied by graduated plates. Power rapid traverse is provided for all the heads and can be operated separately from each head by individual levers. When it is desired to engage the feed or the power rapid traverse the small handles at the end of the rail and on the side heads are turned to the right or left, it being thus impossible to engage both movements simultaneously.

The machine is directly connected to a 75-hp. reversing motor, running at speeds ranging from 250 to 1000 r.p.m. This gives cutting speeds ranging from 18 to 36 ft. per min. and double these



A Planing Machine with Four Heads for Handling Large Size Work

rates for the return. The driving motor can be controlled from either side of the machine by levers connecting with the master switch and these are supplemented by a pendant switch carried on a swiveling arm. In this way control of the motor is secured from any position that is convenient for the workman when setting tools or when the machine is in operation. The driving gears are made of steel castings with teeth cut from the solid metal and the driving pinions are steel forgings. Provision is made for taking up wear in all the driving shaft bearings.

A special oil filter system operated by a 1-hp. motor is provided to supply all the driving gears, driving shaft bearings and table tracks with forced lubrication.

TEST FOR SPELTER COATINGS*

A New Method Offered for Use With Sheets and Wire

It has been customary to express the weight of coating on wire in pounds per mile, while on sheet products the results are usually expressed in ounces per square foot. Obviously, the coating on wire expressed in pounds per mile would have a different meaning for each gage of wire. If the results are expressed in ounces per square foot of surface on both wire and sheets, there will be a better understanding as to the thickness of coating on the respective products. In stating the weight of coating on galvanized sheets it is customary to express the weight based on one surface only, that is, a sheet containing 2 oz. of coating per square foot really contains 1 oz. on each side of the sheet.

It is proposed to express the weight of coating on wire in ounces per square foot, and also to use such lengths of wire that the number of grams of coating found will be equivalent to ounces per square foot, without calculation. These lengths must be such that the surface coated is equal to 5.079 sq. in. It is likewise proposed that the samples for determining the weight of coating on galvanized sheets shall be 2¼ x 2¼ in. (area = 5.079 sq. in.). The number of grams of coating on a section of this size will also express the weight of coating in ounces per square foot without calculation.

The method for determining the weight of spelter coating consists of using a small amount of antimony chloride in hydrochloric acid (sp. gr. 1.20). Antimony chloride appears to hasten the solution of the coating, and after the coating has dissolved a thin film of antimony plates on the surface of the base metal and retards the solution of iron or steel. Experiments have shown that sheet steel 2¼ x 2¼ in. which loses 50 mg. in five minutes in cold hydrochloric acid (sp. gr. 1.20), will lose in that time only 1 mg. in the same acid containing 80 mg. of antimony per 105 c.c. of acid.

DETERMINING SPELTER COATING OF SHEETS

In the proposed method the metal is immersed in the acid only one minute, which is long enough to dissolve several grams of coating, yet the amount of iron or steel dissolved is negligible. The small amount of antimony that plates on the surface of the sample can easily be removed by scrubbing under running water. This method is one of the most rapid and accurate with which the writer is familiar, and a determination can be made in less time than is occupied in making the Preece test.

For determining the weight of coating on galvanized sheets cut several samples 2¼ x 2¼ in. from various parts of the sheet. These samples, about five in number, should be weighed together and immersed singly for 1 min. in 100 c.c. of hydrochloric acid (sp. gr. 1.20), to which has been added 5 c.c. of antimony chloride prepared by dissolving 20 g. of antimony trioxide in 1000 c.c. of hydrochloric acid (sp. gr. 1.20). The same 100 c.c. of hydrochloric acid can be used for at least five samples. Five cubic centimeters of the antimony chloride, however, should be added for each sample on account of the antimony being removed from the solution by the iron.

The samples are washed and scrubbed under running water, dried with a towel, and laid in a warm place for a few seconds. The samples are again weighed together and the number of grams lost is divided by the number of samples taken. Each gram corresponds to 1 oz. of coating per square foot.

DETERMINING SPELTER COATING OF WIRE

A small section of the galvanized wire should be stripped in hydrochloric acid containing antimony chloride. The diameter of the black wire should then be carefully measured in order to determine the length of wire, such that the number of grams of coating will represent the number of ounces per square foot of surface. [These lengths are given in a table in the paper.]

The method of making the test is very similar to that outlined for galvanized sheets, except that the wire is first cleaned with carbon tetrachloride or gasoline, and after being carefully weighed is placed in a tall glass cylinder containing hydrochloric acid (sp. gr. 1.20), to which has been added from 2 to 3 c.c. of antimony-chloride solution of the same strength as used on galvanized sheets. The reason for using one-half the amount of antimony chloride in the case of wire is on account of taking one-half the area. As previously stated, the coating on galvanized sheets is expressed in ounces per square foot, considering one side only, when in reality this amount of coating represents 2 sq. ft. of surface. After immersing the entire length of wire for 1 min. it will be found convenient to pour the acid solution into another tall cylinder in order to facilitate removing the wire. The wire is then scrubbed under running water, wiped, thoroughly dried in a warm place for a few seconds and again weighed. Each gram lost corresponds to 1 oz. of coating per square foot. For direct comparison with the weight of coating as expressed on galvanized sheets, this figure should be doubled.

*From a paper by J. A. Aupperle, metallurgical engineer, American Rolling Mill Company, Middletown, Ohio, read before the American Society for Testing Materials, Atlantic City, N. J., June 22.

A copy has been received of a pamphlet reproducing a lecture by Sir Robert A. Hadfield entitled "History of the Metallurgy of Iron and Steel," delivered at a meeting of graduates of the Institution of Mechanical Engineers, London, February 8, 1915. The lecture covers early metallurgy, French metallurgy in the eighteenth and nineteenth centuries, metallurgy in the middle of the last century, the conservation of new resources, and a detailed description of the author's research work, with special reference to manganese steel, low hysteresis steel, steel alloys, low temperature experiments, etc.

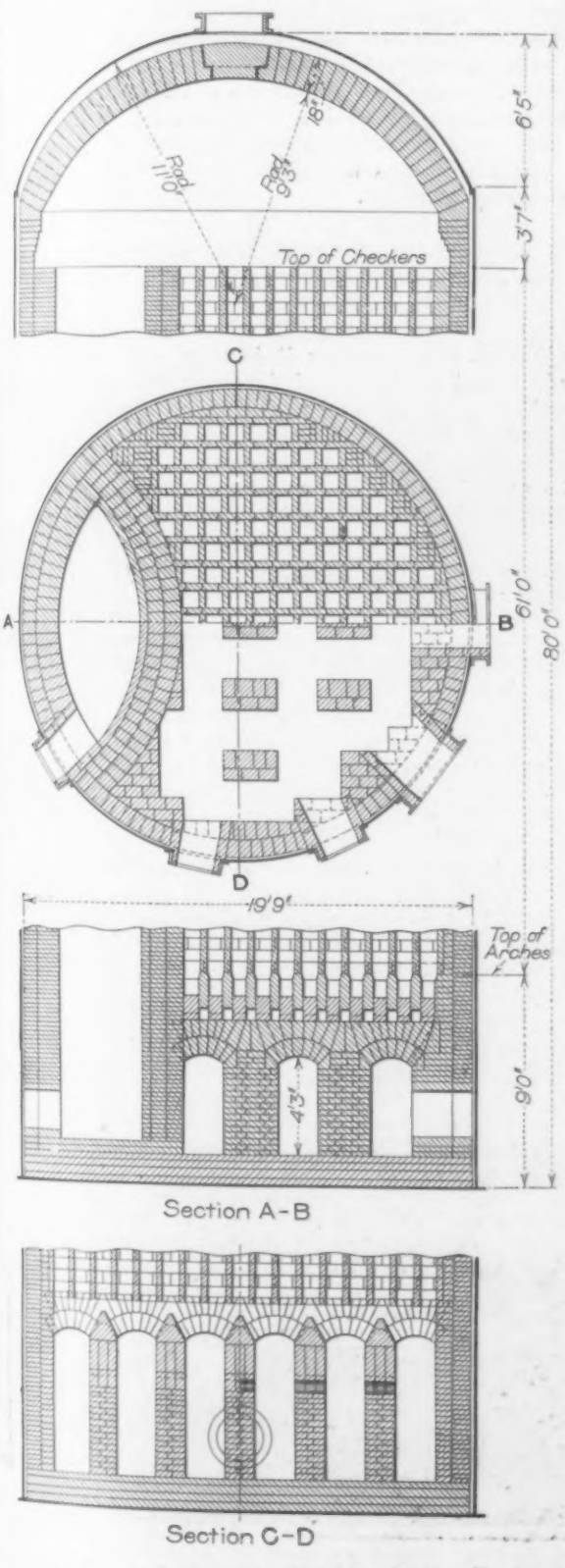
The Baldwin Locomotive Works are now employing 6822 men, compared with 3900 last January, which was about the low point in the company's operations.

Hot Stove With 3-In. Checker Walls

The accompanying drawings show a hot blast stove designed and patented by P. J. Brown, president of the P. J. Brown Construction Company, Cleveland, Ohio. Particular emphasis is placed on the spacing of the piers in the bottom of the stove to allow free access for cleaning and also to the construction of the arches supporting the checker work, which aims to give strength of construction in addition to eliminating displacement of arches through vibration.

An outer wall constructed of 9-in. brick completely encircles the stove, inclosing the checker work and combustion chamber. This wall also supports the dome. The checker work is not bonded into this wall, which permits an independent expansion of checker work from that of the dome and back wall.

In repairing this stove checkers may be taken out and replaced, it is explained, without disturbing the back wall or the bridge wall of the stove. The checker walls are constructed of 6 x 9 in. standard straight brick, laid on the 3-in. face with alternate courses running at right angles to each other, giving a 9-in. square checker with a 3-in. checker wall. The 3-in. brick is calculated to give the structural strength necessary, combined with the thin wall to make it the ideal checker construction. With the exception of shapes in arches and dome, the stove is constructed entirely of standard size brick 3 in. thick.



Plan and Sections of Brown Hot Stove

Industrial Plant Automobile Trailer

A trailer that can be coupled to any type of automobile can probably be put to considerable use around a manufacturing plant in making local deliveries, as well as for carrying loads to and from freight and express offices. Such a car can be used in place of a heavy truck for making deliveries of small loads, or by small, light, manufacturing plants that do not have motor trucks.

A Trailer Designed for Coupling to an Automobile and Handling Loads Which Are too Heavy for a Small Car and not Heavy Enough for a Large Motor Truck

A trailer designed to be attached to an automobile for these and various other purposes has recently been brought out by the Erie Trailer Mfg. Company, Erie, Pa. It is made in various sizes and capacities and in numerous models to suit requirements. The one shown has a strongly constructed wood box, 8 ft. long, 46½ in. wide and 16½ in. high, weighs 500 lb. and has a capacity of 2000 lb. It has 30-in. wheels with 1⅜-in. solid rubber tires. Ball, roller or box bearings are furnished as desired, and some of the models have four wheels. Couplings are furnished to fit all makes of automobiles and after the coupling is affixed to the car body it requires but a moment to couple or uncouple the trailer.

The consumption of aluminum and the production of bauxite in the United States in 1914 were the largest ever recorded. The United States Geological Survey report shows production in 1914 of 219,318 gross tons, valued at $1,069,194, compared with 210,241 tons in 1913, valued at $997,698. Aluminum consumed in this country in 1914 was 79,129,000 lb., against 72,379,000 lb. in 1913 and 65,607,000 lb. in 1912. The production was 150 lb. in 1884, 550,000 lb. in 1894, and 8,600,000 lb. in 1904.

Universal Strainometer of Simple Design*

A Single Instrument That Can Do the Work of an Extensometer and Compressometer on Various Gage Lengths

BY S. H. GRAF

In the municipal, commercial, or college laboratory for testing materials a wide range of work is usually handled, and specimens of sizes other than the ordinary standard ones must often be tested. Although most of the ordinary routine tests are made without deformation measurements within the elastic limit, these data are sometimes required,

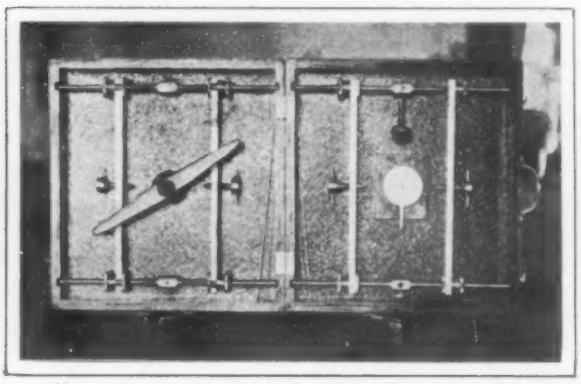


Fig. 1—Universal Strainometer in Case

making it necessary in the past to have at hand at least the following:

1. An extensometer for 2 and 8-in. gage lengths.
2. A compressometer for small specimens, with special collars.
3. A compressometer for 6 or 8-in. concrete cylinders.

It is believed that a simple, direct-indicating, universal instrument for the measurement of both extension and compression would serve all ordinary purposes of the commercial and city laboratories.

The writer and his associates, C. L. Knopf and R. B. Boals, have experimented for several years with various arrangements to accomplish the purpose indicated and have finally arrived at the device shown in Fig. 1.

*From a paper presented at the Eighteenth Annual Meeting of the American Society for Testing Materials at Atlantic City, N. J., June 22 to 26, 1915. The author is assistant professor of experimental engineering, State Agricultural College, Corvallis, Ore.

Briefly stated, the instrument consists of two simple adjustable frames, each carrying two screws bearing on the gage marks on the specimen. One of the frames carries an Ames dial and pivots on a rod held rigidly in the other frame, the dial indicating twice the actual deformation. A toggle clamp prevents the frame from separating from the pivot, and a slender steel rod actuates the staff of the gage head. The error due to tilting of the dial frame within the range of any test is of no consequence, and within the elastic limit it is not a readable quantity.

Figs. 2 and 3 show the instrument applied to various specimens and indicate its range; this range includes specimens either in tension or compression up to 8 in. in diameter or square, and of any gage length from 2 in. up. To adapt the instrument to different gage lengths it is only necessary to use pivot and dial rods of different lengths; for the ordinary lengths of specimens, rods of drill steel ⅛ and 1/16 in. in diameter, respectively, are suitable, while for special tests where the length may be considerable, light wooden strips with steel inserts in the ends are perhaps most satisfactory.

In addition to its universal applicability this strainometer also possesses the following advantages:

1. Ease of use; no special skill being required to read the dial. Dial is zero setting so that there is no troublesome zero reading to subtract; the reading divided by two gives the net deformation.
2. Readings may be taken "on the run" with accuracy, even by an inexperienced observer. Fig. 4 shows load-deformation diagrams plotted from readings actually taken "on the run" by students who had never before read an extensometer or compressomoter of any kind.
3. A change in rate of deformation from any cause is at once plainly apparent.
4. The instrument may be easily and quickly readjusted and applied to any specimen within its range. It is simple, and with ordinary care does not get out of order.
5. It may be constructed by any good mechanic. The only delicate part is the indicating mechanism, consisting of the ordinary form of 0.3 by 0.001-in. Ames

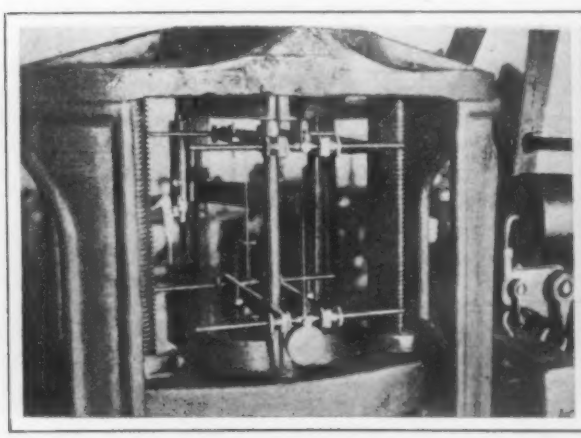


Fig. 2—The Strainometer as an Extensometer on a Tensile Testing Machine for Steel

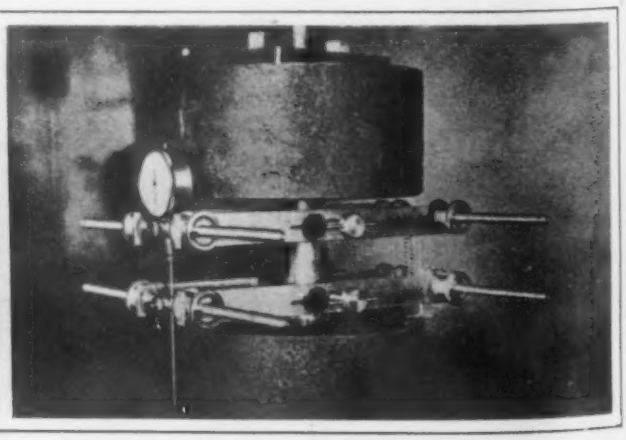


Fig. 3—The Strainometer Used as a Compressometer in Testing Cast Iron

dial with plain back and celluloid crystal, which may be purchased complete and ready to attach.

6. The cost of the instrument complete is low.

The accuracy and reliability of the Ames dial when applied to strain measurements have been well established, and it is not necessary here to cite calibration data for the dial. Repeated calibrations of the complete strainometer as just described, both against a micrometer and against test bars of known modulus, have shown the instrument to be fully as accurate as others designed to read to 0.0001 in. Some of the extensometers and compressometers on the market, while fundamentally of very precise design, are so complicated and cumbersome, as well

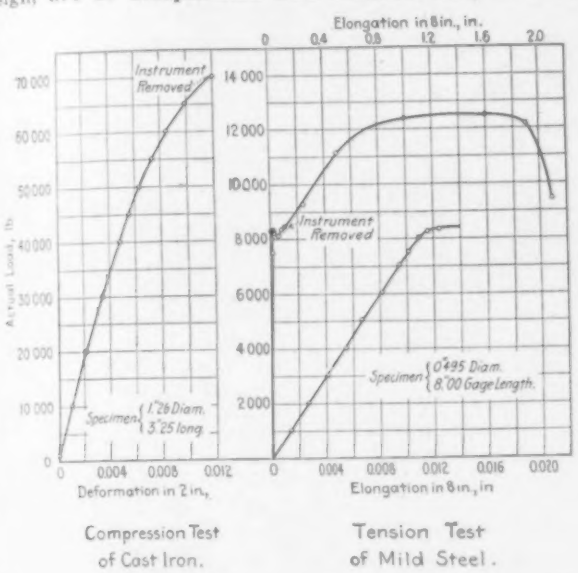


Fig. 4—Load-Deformation Diagrams. Readings Taken "on the Run" by Inexperienced Operators

as slow and difficult to read, that their apparent accuracy as shown by calibration cannot be obtained under operating conditions.

Some objection has been made to instruments having only two (instead of three) points of attachment, but numerous studies made by means of the Berry strain gage on the distribution of stress in various specimens under test have convinced the author that under proper conditions of gripping tension specimens and of bedding compression specimens, the two-point instrument will, with equal care in centering, give the average deformation as faithfully as the other. If provided with three dials or micrometers the three-point instrument is useful in showing roughly the distribution of stress, but this makes the instrument too complicated for all ordinary purposes. Three observers would be required if readings were to be taken on the run, and even when load is applied by increments, it is difficult for a single observer to read three dials or micrometers accurately.

The strainometer as described has now been in use for nearly a year in the laboratory at the Oregon State Agricultural College, and has proved very satisfactory, not only for class work, but also for commercial and investigational work. The author wishes to say that he and his associates claim no great originality for this strainometer, for it really embodies a combination of principles previously applied in various other instruments.

The Studebaker Corporation has taken out life insurance upon each of its employees in the operating departments, office men not being included. It is stated that the amount placed for each individual is sufficient to provide for sickness and funeral expenses and leave a balance for immediate needs of the beneficiaries.

Book Review

The Electric Furnace. By Alfred Stansfield. Pages, XIII + 395, 6¼ x 9¼ in.; illustrations, 155. Published by the McGraw-Hill Book Company, New York. Price, $4.

This is a second edition, revised and enlarged, the first appearing in 1907. In its 400 pages it covers the whole field of electric furnaces, describing those for aluminum, calcium-carbide, brass, carborundum, zinc, tin, copper, nickel, alundum, ferrosilicon, ferrochrome, quartz, phosphorus, carbon bi-sulphide, silicon, graphite, nitrogen, caustic soda, sodium, magnesium, etc., besides most of those for the iron and steel industry. In trying to cover all industries using electric furnaces it does not give the reader a comprehensive idea of the possibilities of these furnaces in any one industry. The volume is a good example of the printer's art and has many excellent illustrations, some showing great detail.

About one-quarter of the book is devoted to descriptions of electric furnaces and processes for making iron and steel. In the limited space given to this important branch of the subject Professor Stansfield not only brings out the good points of nearly all of the electric furnaces used in foundries and steel mills, but gives space also to many furnaces existing only on paper. His work shows the hand of the careful reviewer rather than of the experienced metallurgist and practical operator.

The central thought of the book is the great progress made in all electrochemical industries using an electrothermal or an electrolytic and electrothermal furnace. In referring to the use of direct current in the electric furnace, the author would limit its employment to cases where it is needed for electrolysis—a position which calls for emphasis in view of the frequent attempts to use direct current where only the thermal action is wanted, the electrolytic action proving to be a positive detriment.

It would have been more correct, in saying that "Bessemer and open-hearth steels of practically pure iron only differ from wrought iron in having been fused," to add that their physical properties are vastly different. Moreover, it is hardly correct to say that "in making steel by the Bessemer process the carbon is completely removed . . . and the necessary amount is added in the ladle." The average amount of carbon in blown metal before recarburization is well known and making steel in the ladle has gone out of fashion with the better steel makers long ago.

The Lyon furnace of 1909 for making electric pig in California is said to be "substantially the same as the Domnarvet furnace." There is a similarity in their construction; the great difference is, however, that the Swedish furnace operates as an arc furnace, whereas the 1909 Lyon furnace was operated as a resistance furnace.

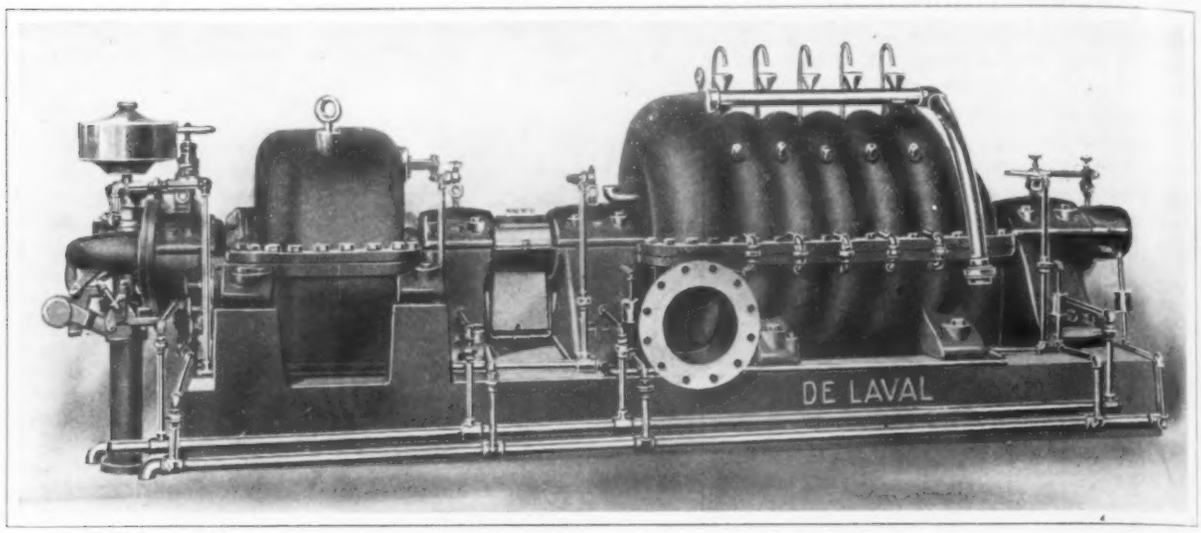
Much less space might well have been given to paper furnaces, laboratory furnaces, college experiments and to furnaces of which only one has even passed the experimental stage, while more should have been devoted to metallurgical discussions; for example, on the advantages of electrically melted ferromanganese for the steel maker.

The treatment is perhaps as thorough as could be expected from a book covering so large a subject, embracing electric furnaces for all possible uses, in comparatively so few pages. It should be welcome as a preliminary review for any interested, prior to studying specifically the furnaces belonging to one of the many industries represented. C. H. VOM B.

The Swedish iron and steel market has decidedly improved from the depression of 1914. The exports for the first three months of 1915 were 90,800 metric tons, compared with 74,200 tons to April 1, 1914, and 87,900 tons to April 1, 1913. The pig-iron exports were 43,300 tons, against only 19,600 tons for the first quarter of 1914. Of the country's 125 blast furnaces 97 were in operation on March 31.

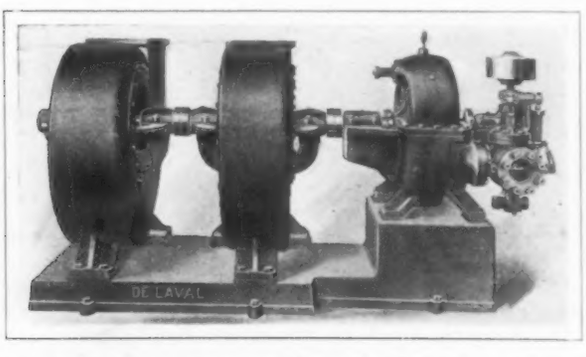
High-Speed Blowers and Compressors

The De Laval Steam Turbine Company, Trenton, N. J., has developed a line of centrifugal blowers and compressors that can be operated at peripheral velocities of 450 to 600 ft. per second. It is possible in practically all cases to connect the blower or compressor directly to the De Laval steam turbine and a pressure of from 3 to 4 lb. per square inch can be generated in a single-stage blower. Among the fields for which this blower can be employed are the supplying of forced draft to boiler furnaces and for coal gas plants and coke ovens.



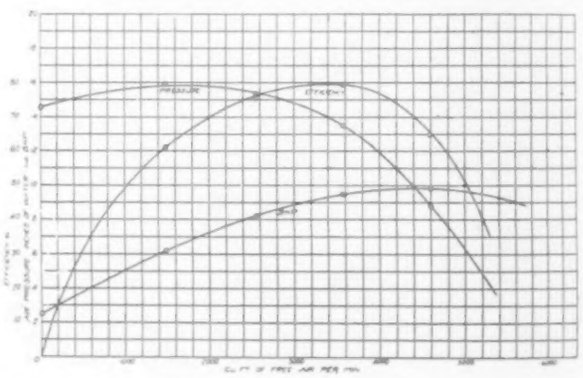
A Six-Stage Centrifugal Air Compressor Driven by a Multi-stage Turbine

The housings of blowers of the double-suction type are in one piece, and are usually made of cast iron. The bearing bracket is cast solid with a circular inlet ring or bell fitting into the eye or opening of the casing, which is of sufficient diameter to enable the impeller to be removed. The housing is formed so as to provide a diffusor and volute, the discharge opening of which is adapted for the attachment of piping. The impeller is built up on a heat-treated chrome-nickel-steel disk, thickened at the center to form a hub and to turn the air which enters axially in a radial direction. One side of each blade or vane is riveted directly to the disk, while the other is fastened to a steel side plate of the same material as the hub. The entrance edges of the blades are set at an angle, which is relied upon to receive the air without shock, and are formed to give the desired characteristics. A labyrinth packing or tightening ring attached to the side plate meshes with a corresponding groove in the circular entrance nozzle. This arrangement, it is emphasized, minimizes leakage from the discharge past the impeller back to the suction.



Two Single-Stage Blowers Driven in Parallel by a Velocity-Stage Steam Turbine. The capacity of the arrangement is 18,000 cu. ft. against 32 in. of water

The characteristics of one of these blowers are shown in the accompanying drawing. It is explained that the form of the head-delivery characteristic can be modified according to the work to be done. Where forced draft is supplied to boiler furnaces, the head-delivery characteristic has a steep slope to give a relatively constant delivery of air through the fire corresponding to the speed for which the turbine, governor or driving motor may be set. Then, it is pointed out, the rate of combustion is constant, irrespective of varying conditions and resistance of the fuel bed. By driving both the stoker and fan from the same source of power,



Characteristics of a Single-Stage Motor-Driven Blower Operating at 2400 R.P.M.

the rates of delivery of fuel and air can be kept at a desired ratio. In coke-oven service the blower operates under a vacuum and delivers against a pressure of approximately 3 lb., handling a gas of low density. For this service, a speed of 3000 to 5000 r.p.m. is possible and changes in the density of the gas can be compensated for by varying the speed. If desired, a practically constant delivery can be maintained against variable resistance. It is also possible, it is added, to drain off the water and tar thrown out of the gas by centrifugal force.

The casing of the compressor is split horizontally, the same as in the builder's centrifugal pump, thus permitting the top half or cover to be lifted off for the inspection of the interior. The impellers are mounted on an open-hearth steel shaft and the hubs of the wheels and impellers are attached to the shaft by keys and are separated from one another by shaft-tightening rings which run inside the split packing rings attached to the diaphragms separating the various stages. These diaphragms are separate from the casing and are di-

vided on a horizontal plane so that they may be removed without removing the shaft and the impellers. Double carbon rings are placed at each end of the casing in addition to the labyrinth rings surrounding the impeller suction inlet and the packing rings on the shaft where gases other than air are handled. Where it is desired to use cooling the diaphragms are hollow, the water entering through the bottom of the casing and escaping at the top. The impellers are of the single-suction shrouded type and are built of heat-treated, chrome-nickel-steel disks, the blades or vanes being riveted to the disks and the side plates, the same as in the case of the blower. A balancing disk at the discharge end arranged so that one side receives the total discharge pressure in a direction opposite to that acting upon the impeller disk while the chamber on the other side of the disk is connected to the suction inlet and is relied upon to overcome the accumulated thrust of all the stages.

These compressors are intended for use in machine shops, mines, shipyards, etc., where a fairly constant pressure over a wide range of delivery is desired, and for cupola and blast-furnace work. Where compressed air is to be used in tools, delivery in capacities of 2000 to 10,000 cu. ft. per minute and pressures ranging from 75 to 120 lb. per square inch are required. The large machines, or those which must be run at speeds corresponding to those available with electric motors, are usually built in two sections and two housings, it being pointed out that the speeds available with electric motors of these sizes necessitate a compressor with a large number of stages and several housings or the use of a step-up gear, by which the compressor can be operated at 4000 to 5000 r.p.m. Cupola and blast-furnace work probably represent as extreme cases as can be found, the capacities ranging from 3500 to 35,000 cu. ft. per minute at pressures of from 6 to 30 lb. In many cases it is possible to utilize exhaust steam from rolling mills, engines, pumps, compressors, etc., for driving and extra power is thus obtained without installing additional boiler capacity or burning more fuel. As is the case with the blower, the head-delivery characteristics can be varied to suit conditions. It is pointed out that where compressors supply mines or machine shops, a considerable proportion of the tools may be shut off without causing a sharp rise in pressure. Where a strictly constant head or strictly constant rate of delivery is required, speed variation or throttling of the suction is resorted to. In the former case, the speed control device is similar to that of the ordinary pump governor, while for maintaining a constant rate of delivery some form of the flow meter controlling the speed of the driving motor or turbine or throttling the air is resorted to.

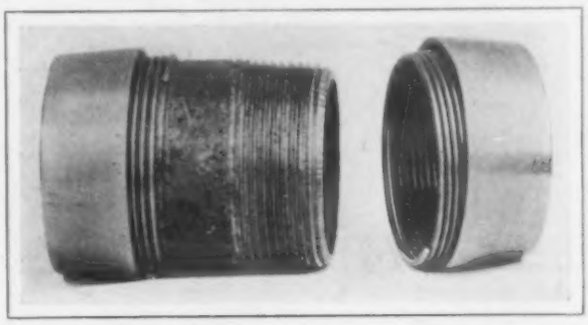
Brass Manufacturers Meet

The National Association of Brass Manufacturers met at Niagara Falls June 29 and 30. It was agreed to discontinue the practice of stamping other than the manufacturer's name on goods shown in the official catalog, believing that this is a matter of advertising entirely due to the manufacturer, and furthermore that it is a mark of identification which in itself stands for protection to the maker. The association also reaffirmed the time-honored custom of allowing cash discount of 2 per cent ten days from date of invoice. Reports from members indicated that their plants were running at an average of 84.52 per cent of their normal capacity. While some reported that they were not up to standard, so far as business is concerned, the tone of the meeting was good, with a better feeling and a tendency to ask higher prices. The next meeting will be held in Cleveland, Ohio, Sept. 15 and 16.

Protector for Threaded Ends of Pipe

For protecting the threaded ends of a pipe, a flexible protector has recently been invented by Edward James, 13,664 Euclid Avenue, East Cleveland, Ohio. Pipe is threaded at the plant in which it is made, and, unless the thread is protected, it is in danger of becoming battered, rusted or otherwise damaged during shipment or while lying around the yard or fields, necessitating partial rethreading before it can be used. The thread protector illustrated is claimed to be so inexpensive that it is commercially practical. It is constructed so that it can be quickly applied to the threaded end of the pipe to which it remains firmly affixed as long as required and can be taken off as quickly as it is put on.

The protector consists of two parts, a helically coiled wire and a stamped metal cap fitted over one end of the wire coil. The internal diameter of the wire coil should preferably be a trifle less than the external diameter of the threaded portion of the pipe on which the device is to be fitted. The cap easily slips over the coil when the latter is in its



A Device for Protecting the Threads on the Ends of a Piece of Pipe in Transit

normal form before it has been put on the pipe end. To apply the device after the coil is slipped into the cap the projecting portion of the coil is started on the thread and by rotation in the proper direction, practically the entire coil is in effect screwed onto the thread. This operation tends to spread the portion of the coil that lies within the cap so as to grip the cylindrical wall of the latter firmly, this spreading being due both to the expanding effect on the portion of the coil produced by screwing the other portion on the pipe thread and also to the taper of the thread itself. In other words, the wire coil is slipped into the cap and will turn only in one direction within the cap and in an opposite direction when applied to the pipe thread.

The cap is removed from right hand threads by a half turn to the left with a pipe wrench. The wire is removable only by pulling it straight off from the pipe thread and is not intended to be used again. The wire coil is produced on an automatic machine from ordinary round galvanized wire. The cap is a smooth tapered stamping, light in weight, with no threads to rust, and it can be returned to the mill and be used over and over again. The use of the closed cap is also designed to prevent large sized pipe from collapsing at the exposed threaded end when the pipe is dropped from some little height, as in unloading from cars, and that end strikes the ground first.

When it is desired to enamel pipe or otherwise coat the interior an annular cap may be used instead of the one with a closed end, the object in case of coated pipe being not only to protect the thread but to keep it free from enamel, japan, or other coating material.

Charpy Impact Test on Treated Steels*

Its Value in Determining the Toughness or Shock-Resisting Qualities of Heat-Treated Steel—How the Shape of the Notch Affects the Results

BY CAPT. J. J. THOMAS, U. S. A.

The object of this paper is to describe a number of experiments made with the Charpy impact machine, for the purpose of determining how the shock-resisting qualities of various steels are affected by heat treatment.

DESCRIPTION OF THE MACHINE

Fig. 1 illustrates the type of machine used. The mounted pendulum A swings about the point O, and is capable of delivering a blow having a total energy of 30 m-kg. (216.99 ft.-lb.). B is a hardened steel knife edge rounded to a radius of 2 mm. The machine is operated by raising the pendulum to an angle of 155 deg. from its lower vertical position, by means of the handle H and connecting worm and wheel. The pointer at X is then set to read zero on the graduated scale S. The test specimen, a small bar 10 by 10 by 60 mm., notched to a depth of 5 mm. at the center, the bottom of notch having a radius of 0.667 mm., is then placed across the knife edges at E, and the pendulum released by the trigger R. The test specimen is literally chopped in two, after which the pendulum ascends to an angle depending on the energy remaining after impact. This angle is registered by the needle on the scale S.

Knowing the weight of the pendulum and the height of its center of gravity before impact, the energy of the blow can be determined. The height of the center of gravity, for the angle of ascension after impact, is registered on the scale S, and thus the energy remaining after impact can be determined. The difference is, of course, the energy absorbed by the test specimen. The lever D operates a brake K, which brings the pendulum to rest after the test.

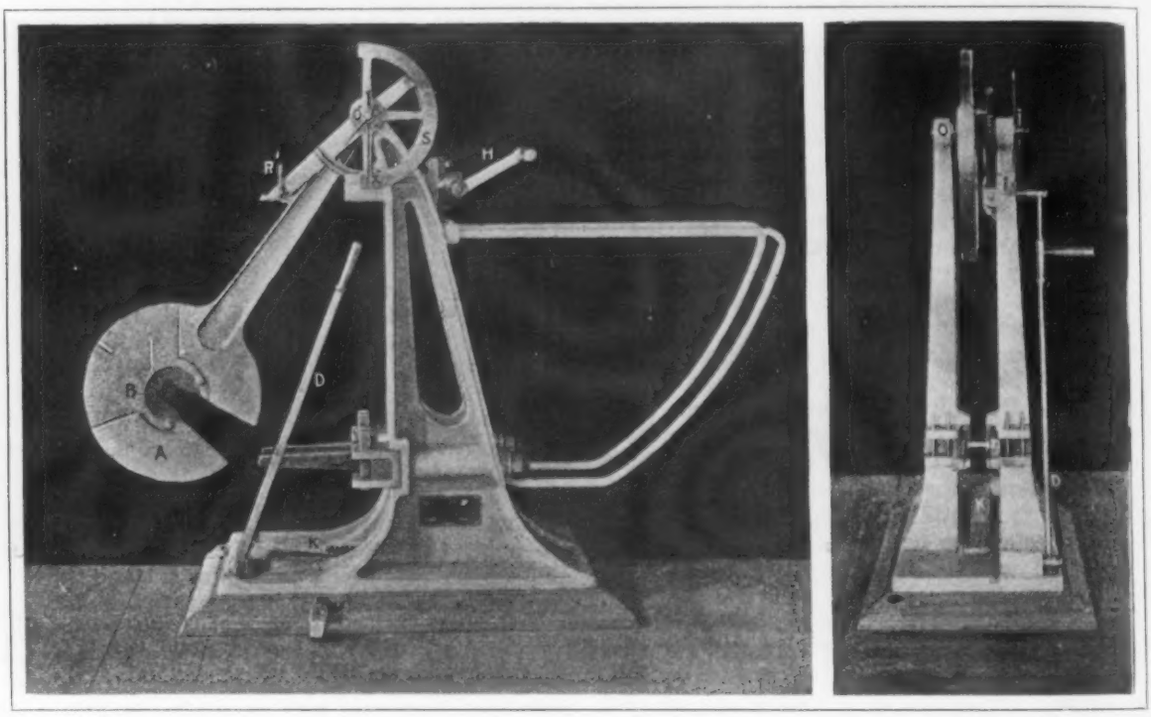


Fig. 1—Two Views of the Charpy Impact Test Machine

TEST OF BROKEN GUN JACKET

A fragment of a broken gun jacket was taken and the metal tested in the original condition; that is, after it had been heat treated as a large gun forging. Other pieces were tested after reheating to 500, 600, 700 and 750 deg. C., respectively, for half an hour, cooling in the furnace. Tension, Charpy impact and hardness tests were made, and photomicrographs taken.

The results of the Charpy tests show that there is considerable variation between the strengths of individual pieces. For this reason, the average of four or more tests should always be taken, before reliable comparisons can be made. It is interesting to note that for the specimens heated to 600 and 500 deg. C., the elastic limit, tensile strength, elongation and Brinell hardness are the same as for the original steel, yet the resistance to shock has increased three-fold. The reduction of area has increased, and this value alone indicates the changed condition of the metal. The structure of test specimens 1, 2 3 and 4 do not differ materially in grain size, but this could hardly be expected as the metal was not heated above the Ac_1 point (739 deg. C.). For the specimen heated above Ac_1 there has been a distinct refining of the grain and a decrease of hardness and strength. From these results it is seen that brittleness is not due to grain size alone. It is probable that the weak impact strength of the

*From a paper presented at the eighteenth annual meeting of the American Society for Testing Materials at Atlantic City, N. J., June 22 to 26, 1915. The author is stationed at the Watertown Arsenal, Watertown, Mass.

original metal was due to internal strains which were relieved by the subsequent reheating.

TESTS OF FORGED AND CAST ALLOY STEELS

For this experiment an ingot of nickel-vanadium steel of the following composition was taken:

	Per cent
Carbon	0.455
Manganese	0.50
Silicon	0.23
Sulphur	0.049
Phosphorus	0.033
Nickel	3.45
Vanadium	0.27

The ingot was cast in a dry-sand mold 20 in. in diameter and 50 in. long. After casting, the ingot was heated to 950 deg. C., air chilled, and then returned to the furnace at 400 deg. C. and allowed to cool with the furnace. It was again heated to 1000 deg. C. and air chilled. A slab 4 in. thick and 20 in. diameter was then cut from the ingot and split across a diameter. One-half was forged down to a slab 5 in. wide by 1 in. thick, the other half remaining in the cast condition. The forging operations were all normal and the forging finished above the Ac_1 point (710 deg. C.).

Specimens of both forged and cast steels were tested in the original condition, after which the remaining pieces were given heat treatments. Both forged and cast steels were given exactly the same heat treatments for the same length of time, in order that a direct comparison could be made. With the exception of the two lower drawing temperatures, 350 and 450 deg. C., we see that the same heat treatment has produced practically the same elastic limit and tensile strength, but that the resistance to shock and the ductility have been greatly increased by forging. The maximum increase in

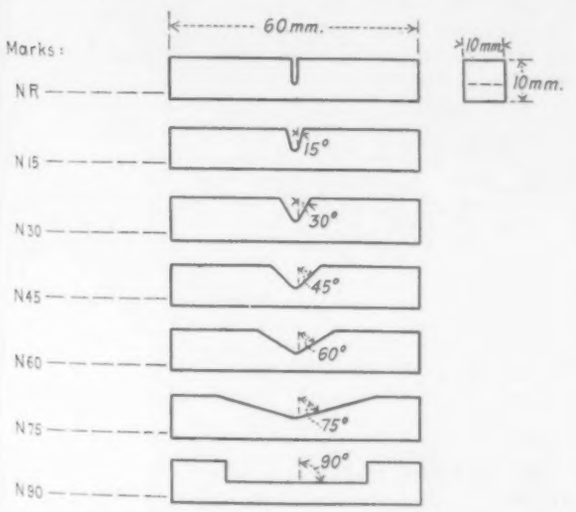


Fig. 2—Charpy Test Specimens with Various Angles

impact strength appears to be reached in both cases at a drawing temperature of 650 deg. C. Higher drawing temperatures produce no material increase in shock strength, probably due to the fact that the steel is entering the critical range and a transformation, or recrystallization occurs.

EFFECT OF RATE OF COOLING AFTER DRAWING (OR TEMPERING)

The general plan for carrying out this investigation was as follows: 24 similar pieces of a hypoeutectoid steel, all of which should be in the same physical condition and each large enough to cut into six Charpy test specimens were to be quenched in water from 25 deg. C. above the Ar_1 point. These 24 pieces of hardened steel were drawn at various temperatures, 300 to 725 deg. C., and cooled in the furnace, in the air and in water.

For this experiment a mild steel of the following composition was chosen:

	Per cent
Carbon	0.20
Manganese	0.40
Silicon	0.032
Sulphur	0.033
Phosphorus	0.012

All heating operations were carried out in a small electric muffle furnace. The temperatures were measured by a calibrated pt. pt.-rh. couple used with a Leeds and Northrup precision potentiometer. All pieces were heated to 900 deg. C., allowed to cool to 825 deg. C. and then quenched in cold water. The specimens were then placed in the furnace, brought to the desired drawing temperature, held one-half hour and cooled in furnace, air or water, as indicated in the program.

As with the tests of alloy steels it will be noted that the maximum resistance to shock is obtained by drawing at 650 deg. C. In every case the average resistance to shock is less for the water-cooled specimens than for those cooled in the furnace. This decrease in the resistance to shock varies from 4 to 22 per cent. The air-cooled pieces, although more inconsistent, show a similar tendency. For the three upper drawing temperatures, the resistance to shock of the air-cooled specimens, lies between the furnace and water-cooled specimens, as might be expected.

In the case of the specimens drawn at 725 deg. C. the water-cooled show the greatest resistance to shock, the air-cooled next, and the furnace-cooled least. This is explained by the fact that the specimens having been heated to 725 deg. C., had passed the Ac_1 point, and in the case of the slowly cooled specimens, a true annealing had occurred. The specimens which were water quenched at this temperature were hardened in the critical range and gave a shock test almost equal to the specimens which were drawn at 700 deg. C.

The Brinell hardness is greater in every case for the water-cooled than for the furnace-cooled specimens, in spite of the fact that all specimens were quenched below the Ac_1 point where no critical points exist, and no allotropic changes occur. It appears to the author that as these variations in hardness occur below Ac_1 they must be independent of the carbon content of the steel, and therefore, the results obtained with this 0.20-per-cent carbon-steel would hold good for steels of varying carbon content. It is probable that the variations in hardness and toughness may be due in internal stresses set up, caused by unequal contraction in the material during quenching.

EFFECT OF THE SHAPE OF THE NOTCH

With a view to determining the effect of the shape of the notch on the results of Charpy impact tests, the following experiment was carried out:

The Charpy impact machine used is one of 30 m-kg. or 216.99 ft.-lb. capacity. The standard transverse specimen for this machine is 10 x 10 x 60 mm. with a notch 1.3 mm. wide by 5 mm. deep, midway along one side. This is a difficult piece to machine from hard steels on account of the narrowness of the notch. If a suitably shaped test specimen could be found, which would give comparative results with the standard and would be at the same time easier to machine, it would perhaps be advantageous to adopt it.

A piece of hot-rolled machinery steel ½ x 3 x 28 in. was selected from stock and cut into lengths

of 3 in. The analysis of this material was as follows:

	Per cent
Carbon	0.134
Manganese	0.39
Silicon	0.015
Sulphur	0.021
Phosphorus	0.017

The pieces when cut to length were annealed by heating slowly to 875 deg. C. They were held at this temperature ten minutes and allowed to cool slowly in the furnace over a period of 5 or 6 hours to room temperature. From each of the annealed pieces six transverse Charpy test specimens were machined as indicated in Fig. 2. The specimens were all taken out along the original direction of rolling of the bar. These specimens were tested in the Charpy machine in the usual manner and the results are shown in the table. The angle of bend shown represents the amount the specimens bent before rupture. These figures were obtained by putting the broken ends together after fracture, and measuring this angle.

An examination of the table will show that the widening out of the notch did not greatly affect the average figures for resistance to shock until the slope of the side of the notch exceeded 45 deg. The figures for resistance to shock of the 15-deg. specimens are somewhat higher than those for either the regular or the 30-deg. specimens. This difference, however, is hardly greater than may be accounted for by experimental error. It will be noticed in this connection that the Brinell hardness numbers of these specimens are the lowest of any, and, in general, the lower the hardness is, the greater is the resistance to shock. Figures for the angle at the bend have been recorded, though these are somewhat uncertain, owing to the difficulty of satisfactorily placing together the two broken ends of the specimen.

Table showing the effect of the shape of the notch

Specimen No.	Charpy results, ft.-lb. per sq. in. Max.	Min.	Average of six specimens	Angle of bend, deg.	Brinell hardness number; average of three specimens	Remarks
N R	304.0	266.5	284.75	15.8	79.1	Regular specimen.
N 15°	345.9	283.0	315.70a	15.2	77.5	
N 30°	322.5	284.0	298.10	15.0	80.9	
N 45°	382.0	304.0	333.67	29.5	80.0	
N 60°	571.0	516.0	539.17	54.2	79.8	Fractured but did not separate.
N 75°	890.0	818.0	853.83	139.0	78.4	Fractured halfway through. Did not separate.
N 90°	830.0	806.0	814.5	136.0	78.4	Bent, but no fracture.

a Average of five specimens.

These figures, however, agree fairly closely with those for the shock strength.

CONCLUSIONS

Although the Charpy impact test is little used in this country it is believed that the above experiments indicate its value in determining the toughness or shock-resisting qualities of heat-treated steel.

The results given with tests of alloy steels prove conclusively that no reliable comparisons can be made by breaking single test specimens. From four to six similar specimens should be broken and the average value obtained before comparisons are made. In all four experiments a standard test specimen 10 x 10 x 60 mm. was used, the span being 40 mm. Although the notch is usually made 1.3 mm. wide by 5 mm. deep, the results of tests of the effect of shape of notch indicate that the sides may be flared to an angle of 30 deg. without introducing an appreciable error.

The maximum resistance to shock appears to be reached in quenched steels by drawing or tempering at 650 deg. C. or just under the Ac_1 point. Water quenching after drawing appears to reduce the shock strength of heat-treated steels, the cause of which is unknown but appears to be due to internal stresses set up by unequal cooling. The forging of steel appears to give it a toughness which cannot be obtained by heat treatment alone.

Italy Seeking American Pig Iron and Coke

WASHINGTON, D. C., July 13, 1915.—As some American producers have already learned through inquiries received, there is an opportunity, because of war conditions, for the United States to acquire coke and iron business in Italy, according to advices received by the Chamber of Commerce of the United States from Charles F. Hauss, president of the American Chamber of Commerce in Milan. Mr. Hauss informs the National Chamber that war between Italy and Germany has stopped entirely the shipment of foundry coke and low grade pig iron from Germany, and the local producers, which are the Solvay Process Works at Vado and Savona, near Genoa, are closed because they have no coal. Until the war is over very little coal and coke will come from England, from which country Italy has been importing about 70,000 tons of coke per year. The imports from Germany, Austria and Belgium amounted to 220,000 tons of coke per year.

"If the present feeling can be depended upon," Mr. Hauss says, "Italy will probably never purchase from Germany again, or if she does it will be after a long time, so that America never had a better opportunity to get and hold the coke and iron business in Italy. We have, therefore, cabled that there is a great demand for foundry coke and pig iron and requested that you wire prices." Mr. Hauss suggests to prospective senders that the date should be given at which sailing can be had. The unloading and handling charges to put the goods on cars at Genoa or Savona would be about 50 cents a ton, and the freight from these ports to Milan is just under $2 a ton. The port of Savona has special facilities for unloading coal and coke. The foundry coke which has come from Westphalia in the past was delivered in Milan at from $11 to $12 a ton, and at present those who have any coke in stock are getting anywhere from $20 upward a ton.

A strong demand has developed in Italy for iron that compares in analysis with English hematite. American pig iron for malleable use, as well as foundry irons, is wanted also. If the makers of pig iron care to investigate what appears to be an opening in Italy, the Milan Chamber will be pleased to have them send over their analyses, together with prices at the seaboard in America, as well as in Genoa. The hematite, which sold before the war at about $21 delivered, has sold as high as $45 to $50, as the only iron available is Spanish hematite of which the quantity is limited. High phosphorus iron sold at from $18 to $19 before the war and those who have any in stock could sell it now for $30. The landing charges, freight and duty from c.i.f. steamer to delivery in Turin or Milan would be about $4.50, of which $2 is freight, $2 duty and the rest handling and unloading.

The committee on transportation of the Milan Chamber is studying the matter of finding return cargoes for American steamers, and besides the colored and Carrara marble, has in view zinc and lead hematite and iron ore from the Island of Sardinia. There is naturally the usual higher grade freight in alimentary products as well as wine, cheese and silk. The financial committee of the Milan Chamber is also at work on an arrangement between the banks in Italy and in the United States that would advance money on bills of lading, thus avoiding the disagreeable demand for payment in advance.

W. L. C.

A 200-Hp. High Compression Oil Engine

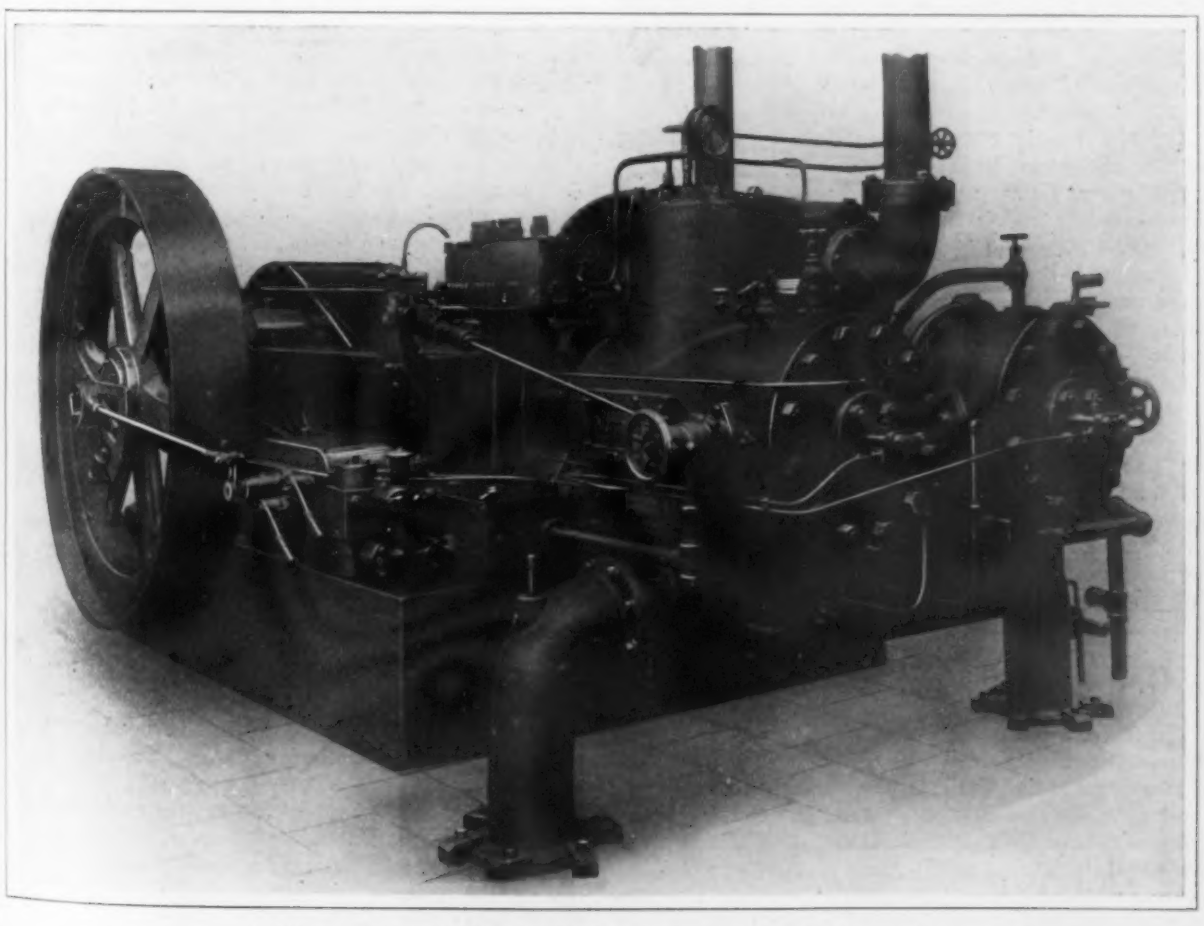
The Nordberg Mfg. Company, Milwaukee, Wis., is supplementing its line of Diesel engines of the Carels Freres type by a high compression oil engine built in sizes ranging from 50 to 200 hp. These engines resemble the Diesel engines insofar as the method of ignition by the heat of highly compressed air is concerned, the compression pressure being approximately 450 lb., but a three-stage high-pressure air compressor for injecting and atomizing the fuel is not used, the fuel being injected mechanically by a small pump and discharged through a new type of atomizing head. The elimination of this compressor with its intercoolers, it is pointed out, simplifies the installation in small plants for which these engines are designed.

The engine is of the two-cycle type and valves, cams, springs and valve gear have been eliminated. The head is a symmetrical casting. There are no valves in the head, the only valve on the engine being a piston valve for scavenging air located above and between the cylinders. A single valve controls the scavenging air for the two cylinders and the air is compressed on the crankside of the piston and bypassed to the head end, shortly after the exhaust valves are uncovered. This arrangement forces the burnt gases out of the cylinder and fills it with fresh air, compression and combustion then occurring as in any two-cycle engine. The air intake is through the vertical pipes above the engine, and the exhaust is through the pipes going through the floor.

A special automatic starting arrangement has been designed to enable the engine to be brought up to speed in less than 1 min. The engine is started by rocking an air valve which turns the engine over and at the same time throws in two auxiliary air cams that control the admission of air at the proper points in the stroke of each of the two cylinders. The starting air is furnished by a steel tank that has been previously charged to 250 lb. from a small auxiliary compressor. When the engine has come up to speed one of the cams is thrown out by a finger and at the same time the corresponding fuel pump is thrown into action by a lever on the side of the engine. As soon as this cylinder fires, the air cam for the other cylinder is thrown out and the second fuel pump thrown into gear, at which time the engine is under the control of the governor.

The fuel pumps draw oil from the storage tank through a small strainer box located at the right and behind the pump. A small heating coil, through which the heated jacket water circulates, is located in the main oil compartment of the strainer box and is relied upon to insure free flow of the very viscuous oils. The pumps are operated by cams driven by an eccentric and deliver a quantity of oil in excess of that required for the maximum load, the governor acting to by-pass more or less of the fuel depending on the load being carried. The by-passed oil is discharged through a sight glass and gives the operator a check on the working of the pumps. The governor is of the flywheel design and gives a regulation of 2 per cent from no load to full load. From the fuel pumps the oil is discharged through small pipes to the atomizer heads bolted to the main cylinders. This device is relied upon to break the fuel up into fine particles and to distribute it evenly over the entire section of the cylinder.

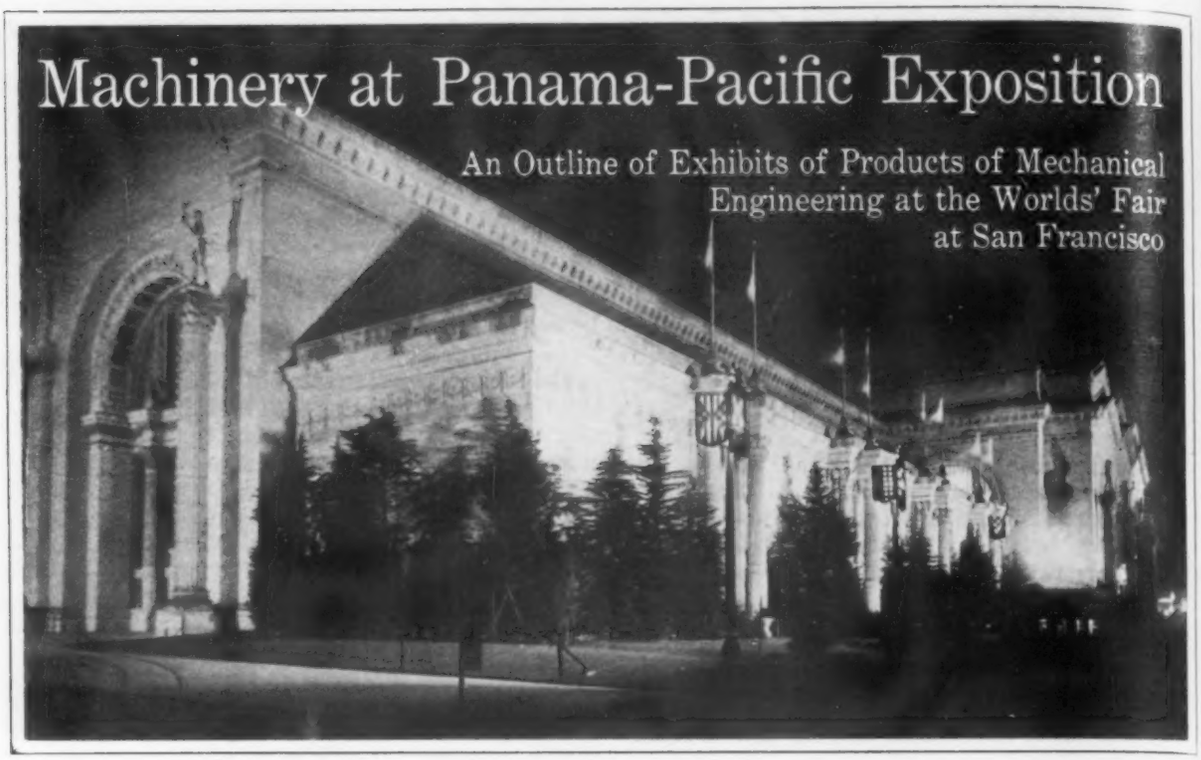
The lubricating system is automatic, the oil being fed from a central pump driven from the scavenging valve eccentric. Cylinder oil is pumped to the scavenging air valve and to the main cylinders while oil for the bearings is pumped to all main bearings, to the crosshead pins through trombone oilers and to all auxiliary bearings. The cranks are inclosed by iron guards and the oil accumulating in the crank case from the various parts of the engine is drained through a filter and returned to the lubricator.



A 200-Hp. High Compression Engine with Special Atomizing Heads

Machinery at Panama-Pacific Exposition

An Outline of Exhibits of Products of Mechanical Engineering at the Worlds' Fair at San Francisco



IF one has never been across his country, he will feel particularly well repaid this year. He needs merely to view the outside of the Exposition at San Francisco to be satisfied. This, particularly at night, is an enchanted city; but in the daytime it is singularly beautiful and possesses besides an atmosphere of permanency which has rarely if ever been true of exposition buildings. Its stable appearance is due in part to the treatment given the exterior stucco finish, making it look like Travertine marble. Of its marvelous illumination and the striking engineering problems of the Exposition as a whole, nothing need be added to the not-overstated contribution in THE IRON AGE of Jan. 7, 1915.

If the inside disappoints slightly, the visitor will nevertheless have no regret. There are exhibits of unusual interest and some, though not many coming under the head of mechanical engineering, which mark steps in industrial progress. The value in the exhibits rises from the decision made early by the Exposition authorities that exhibits were to be educational in character and not merely displays of manufactured products and if possible should stand for the latest methods and kinds. What disappointment there is is the result of the meager participation by the industries of the Eastern part of the country, not to mention the inadequate foreign representation. When it is appreciated that reservations for over 1,000,000 sq. ft. of floor space were canceled a few days after the declaration of war in Europe, the surprise is that the Exposition is as instructive as it is; and it is clear that the Exposition authorities must have redoubled efforts to fill spaces which otherwise would in themselves have been serious drawbacks to sustained interest.

In the exhibits which represent the developments of mechanical engineering, there is a recognition of the demands of the Pacific Coast, and in this respect considerable of the showing in the Machinery Palace is sectional rather than national. Prominent are exhibits of oil and other internal combustion engines; well-drilling machinery; mining machinery; centrifugal pumping machinery; road-making machinery, and also machinery for the lumber industry, though this is perhaps not so large as might be expected in a section notable for its lumber business. There is considerable to be seen in machine tools, but some large manufacturers of metal working and woodworking machinery are conspicuous by their absence.

Considered by itself, the Exposition would suggest that the internal combustion motor, particularly the Diesel type of oil engine, is the coming type of prime mover, although the Exposition also marks the permanent place of the central power station. There are perhaps three ordinary size steam engines on exhibition, none under operation, and the steam turbine is likewise inconspicuous, one of moderate size shown, partly assembled as a matter of general education. The magnitude of the hydroelectric power developments on the Pacific Coast and a nearby central station of the city made it inadvisable to accept special prime movers of large size for Exposition purposes, and this is offered in partial explanation of the prominence consequently given to the internal combustion engine. As regards these prime movers, most are offered for marine propulsion, in this respect also emphasizing the coastal location of the Exposition. Numerous pumping engines of high rotative speeds for belt or direct motor driving are noteworthy, particularly in the absence of large steam-engine pumping units which have marked other expositions. The electric motor for individual machine driving is of course general. The mechanical engineering involved in locomotives and automobiles is not here considered, but has received some attention in the exhibits in the Palace of Transportation. What there is in the oil engine exhibit may be briefly indicated: there is a 600-hp. McIntosh & Seymour Diesel engine, a 500-hp. Busch-Sulzer Brothers Diesel engine, a 180-hp. 6-cylinder New London engine and 75-hp. 3-cylinder 2-cycle valveless Mietz oil engine.

The advances made in indicating and recording instruments and the widened scope of application of these instruments; the increasing use of conveying apparatus and appliances adapted to the industrial plant; the advances in testing machinery for the industrial plant as well as the expert's labora-

tory, and the development in the art of cutting metals and many other materials, from granite and glass to leather, by means of abrasive materials, are also features of the offerings in mechanical engineering.

The greatest industrial exhibit of the Exposition is, of course, that of the United States Steel Corporation, illustrated in part in THE IRON AGE of April 1. It is an amazing collection of models, samples of products and photographs of subsidiaries of the Corporation not alone of educational value to the average visitor, but suitable for study at length by the investigator. The exhibits occupy a large area in the Palace of Mines and Metallurgy, and, like a number of other exhibits of the Exposition, notably those of different departments of the Government, a motion picture theater has been provided. Here there is a series of motion picture films covering the range of operations from the mining of the ore to the completion of iron and steel products and taking practically an entire day for presentation. A schedule of hours when different phases of the manufacture are shown is posted for the benefit of visitors.

While not exclusively mechanical engineering, the Government exhibits in a number of the main exhibition palaces have added immeasurably to the value of the Exposition as a whole, and mention should also be made of the daily long distance telephone communications which are set up between New York and San Francisco. Also marking a triumph is a combination use of the phonograph and telephone in connection with the "largest moving platform in the world." This is to be seen in an exhibit of the Zone known as "The Panama Canal." This briefly described is as follows: Spectators are seated in opera type chairs on a moving platform which rides on a long oval track encircling and commanding a bird's-eye view of a model of the Panama Canal of 5 acres extent. Each observer, with telephone receivers to his ears, receives a lecture from phonographs. In a central phonograph station are groups of phonographs so that each observer is automatically connected to the proper phonograph so that the lecture covers parts of the Canal model immediately in his view. Another Zone attraction which is noteworthy from the mechanical standpoint is a steel-constructed aeroscope illustrated in THE IRON AGE of Jan. 21, 1915.

Subjoined is an enumeration of exhibits bearing mostly on the metal industries and listed under company names. They are mostly in the Machinery Palace, but when in some of the other main exhibit palaces the fact is specially indicated.

Exhibits In Machinery and Other Palaces

Acme Machinery Company, Cleveland, Ohio, exhibits a rivet heading machine of 1¼-in. capacity; a bolt cutter and a six-spindle semi-automatic nut tapper. Represented by Harron, Rickard & McCone, San Francisco.

Advance Pump & Compressor Company, Battle Creek, Mich. Various pumps, including a 5000-gal. pump intended for irrigation work, delivering through banded redwood pipe to an exhibition waterfall.

Aetna Life Insurance Company, Hartford, Conn., has in the Palace of Mines and Metallurgy a wide range of working exhibits and models of safety devices and numerous photographs for those making a study of the subject. A model factory is included to indicate in one case the conditions with poor lighting and lack of safeguards and in the other conditions in a model factory with protection to stairways, Grinnell automatic fire extinguishers, a better angle for stairways, the utilization of spaces under stairways for toilet purposes and an enclosed fire escape of the so-called Philadelphia type, as well as a first aid room.

Allen Mfg. Company, Hartford, Conn. Shows safety set screws in the exhibit of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Allentown Rolling Mills, Allentown, Pa. Exhibits the Aldrich triplex pump, one of 75 hp., motor driven, for a 500-ft. head, and another of 20 hp. for 35-gal. a min. capacity against 1500-ft. head. Represented by Harron, Rickard & McCone, San Francisco.

T. R. Almond Mfg. Company, Ashburnham, Mass. Chucks shown by Fred Ward & Son, Inc., San Francisco.

Alsop Process Company, St. Louis. Jointer guard shown in exhibit of Aetna Life Insurance Company, Palace of Mines and Metallurgy.

The Spirit of Genius at the Main Entrance to Machinery Palace

American Abrasive Metals Company, New York City. Shows safety shoes for ladders in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

American Hoist & Derrick Company, St. Paul, Minn. Showing hoists with steam engine and electric drive. Represented by Harron, Rickard & McCone, San Francisco.

American Mason Safety Tread Company, Lowell, Mass. Shows safety shoes for ladders in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

American Pulley Company. A 72-in. steel split pulley is driven by a silk thread. A device for measuring fractions of a horsepower is shown. Raymond P. Smith in charge. Exhibit further mentioned under Meese & Gottfried Company.

American Rolling Mills Company, Middletown, Ohio. An attractive display in the Palace of Mines and Metallurgy of the Armco culverts and a showing of the use of metal on the farm and of steel stoves made of ingot iron.

American Safety Hook Co. Shows a safety hook for chains in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

American Steam Pump Company, Battle Creek, Mich. Exhibit includes direct-acting steam pumps, power-driven air compressors, horizontal power pumps, centrifugal pumps, a small motor-driven 2-stage compressor of 2 to 3 cu. ft. capacity to 100 to 120 lb. pressure and a direct-acting single hydraulic pump. Represented by the Simonds Machinery Company, San Francisco, J. F. Jeffrey in charge.

American Tool Works Company, Cincinnati. Exhibits among other things a planer, 24-in. shaper,

3-ft. radial drill, a heavy-duty lathe and a tool room lathe. Represented by Fred Ward & Son, Inc., San Francisco.

American Well Works, Aurora, Ill. Exhibits among other things a vertical single-stage centrifugal pump and a horizontal high-pressure multiple-stage centrifugal pump, both types arranged for belt driving. Its Pacific Coast representative, the Hydraulic Engineering & Supply Company, San Francisco, is in charge.

Max Ams Machine Company, Mt. Vernon, N. Y. Besides sheet metal presses and die and special machinery for working on tin and other sheets, it shows the complete machinery equipment in operation for a can-making plant. Represented by the Berger & Carter Company, San Francisco, H. K. McJunkin in charge for this company and C. E. Pike for the Max Ams Company.

Armstrong Bros. Tool Company, Chicago. Besides revolving tables showing the products of the company, informative side displays include a Monarch geared head lathe for conducting tests of tools and drills, a universal form of tool for use in odd corners or difficult situations, a one-man pulley hanger and the Armstrong tool steel disc cutter. Joseph C. Fletcher is in charge.

Armstrong Cork Company, Pittsburgh. Exhibit in the Palace of Manufactures of uses of cork and cork products for insulation; for minimizing vibration in machinery foundations of diatomaceous earth, known also as Kieselguhr; models showing the use of Nonpareil insulating brick for heat treating and muffle furnaces, beehive coke ovens and the like; and an electric furnace, this having a 4½-in. course of brick and heating coils of nichrome wire manufactured by the Driver Harris Company, Harrison, N. J. T. O. Cowdrey and Charles L. Wilson are in charge.

E. C. Atkins & Co., Indianapolis. Shows among other things 65 ft. of 16-in. steel band saw rolled into a coil without damage. Other saw products are shown in connection with the exhibit of the Hanchett Swage Works, Big Rapids, Mich. Frank Wells is in charge, Palace of Manufactures.

Aurora Tool Works, Aurora, Ind. Two drills shown by Harron, Rickard & McCone, San Francisco.

Automatic Transportation Company, Buffalo, N. Y. An exhibit in Transportation Palace and also of cars in use by the Exposition's Service Department.

Babcock & Wilcox Company. A section of the steam boiler that was in operation under steam at the 1876 Exposition in Philadelphia is shown with the explanation that the essential principles of the modern boiler are the same except that in place of the cast-iron header wrought steel headers are now used and wrought steel drum heads take the place of cast-iron drum heads. The modern type of boilers is also shown in section equipped with the Babcock & Wilcox superheater and a Peabody patented oil furnace is also shown, as well as sections of Rust and Stirling boilers. V. W. Hoxie is in charge of the Babcock & Wilcox Company and Charles C. Moore & Co. are the Pacific Coast representatives, Geo. W. Morton in charge.

Bailey & Blendinger Mfg. Co., Woburn, Mass. Case of machine knives shown by Fred Ward & Son, Inc., San Francisco.

Fred Barcroft, Madera, Cal. Shows a multiple punching machine for sheet metal trade.

Barnes Tool Company, New Haven, Conn. Shows large pipe cutters in the Palace of Varied Industries. George P. Stephan, Jr., in charge.

Barrett Mfg. Company. An instructive exhibit showing the byproducts in coke manufacture, including benzol, toluol and phenol, and the uses of tar products for roofs, roads, etc., in the Palace of Mines and Metallurgy.

Beach Mfg. Company, Montrose, Pa. Woodworking machinery, shown by Harron, Rickard & McCone, San Francisco.

Berger & Carter Company, San Francisco. Large exhibit of a number of companies which it represents and which are here separately listed. H. K. McJunkin in charge.

Bessemer Gas Engine Company, Grove City, Pa. Twin-cylinder 165-hp. engine working on California fuel oil and direct connected to a Jantz & Leist Electric Company's 100-kw. 230-volt direct-current generator operating at 250 r.p.m. and at times supplying power to Machinery Palace. Another engine is geared to drive a pump for 1000-lb. hydraulic pressure and an 80-hp. engine is roped to a 12-in. Advance centrifugal pump which delivers to a waterfall, forming one of the spectacular features of the exhibit. Engines of 2 to 10 hp. are also shown for use with kerosene or distillate. J. W. Meek is in charge.

E. W. Bliss Company, Brooklyn, N. Y. The exhibit comprises in the main an elaborate working installation of can-making machinery and machines in operation for punching and deep drawing processes, with many samples of products made by Bliss machinery, not to mention a submarine torpedo. E. A. Main, Pacific Coast manager, is in charge. The company also shows machines of small size safeguarded, in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Charles Bond Company, Philadelphia. Exhibits leather belting and flexible insulated couplings in conjunction with the Bond Foundry & Machine Company.

Bond Foundry & Machine Company, Manheim, Pa. Operating exhibit of hangers, clutches, belting and power transmitting machinery generally, with special display of couplings and steel hangers. William D. Gross is in charge.

Bowers Rubber Works, San Francisco. Piston packing, rubber belting, etc. Process of manufacture shown in Palace of Manufactures.

Bridgeport Brass Company, Bridgeport, Conn. Displays in the Palace of Mines and Metallurgy, brass screw machine products, automobile tire pumps, plumbing and other brass piping, brass stampings of various kinds, copper rivets and the like.

Bristol Company, Waterbury, Conn. A highly educational display showing the widening scope of application of indicating and recording apparatus, with numerous simple contrivances to show how each form of instrument secures the results desired. The demonstration models, as well as the commercial instruments, include counters, thermometers, pyrometers, time recorders, humidity recorders, speed recorders, sensitive vacuum gages, arranged also for long distance reading. The exhibit includes a double strip recorder for obtaining, for example, the temperature of the hot blast to and the top gas from a blast furnace and strip charts for recording operation or production of machinery. Steel belt plates for splicing belting; safety set screws and sprocket wheels for small chain drives are shown. The exhibit is in charge of B. J. Klein and Frank Van Vleck. The company's safety set screws are also shown in the exhibit of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Broderick & Bascom Rope Company, St. Louis. An elaborate revolving display in the Palace of Manufactures, indicating how wire rope is made, and emphasizing the yellow strand rope of this company as well as crucible steel rope, plow steel rope, Swedish iron hoisting rope. By way of especial attraction, a large carving set is shown made at the St. Louis factory from "power steel wires."

Brown Portable Elevator Company, Chicago. A working exhibit of package handling elevators and conveyors, including car loaders. O. H. Oertel in charge.

Brown & Sharpe Mfg. Company, Providence, R. I. Wheelbarrow safety handles are shown in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Buffalo Gasoline Motor Company, Buffalo, N. Y. Engines of the marine type. L. N. Fischer in charge.

Builders Iron Foundry, Providence, R. I. A number of double grinding wheels on columns or stands are shown in the exhibit of Harron, Rickard & McCone, and Venturi meters in exhibit of the Pelton Water Wheel Company.

J. H. Burnett Iron Works, Fresno, Cal. Exhibits a nut-locking bolt for rail joints, hand shears, automobiles, etc.

Busch-Sulzer Brothers-Diesel Engine Company, St. Louis. A 4-cylinder 500-hp. engine using California oil is in operation, supplying power to Machinery Palace, and forming a conspicuous feature of the building. At one end—it is a vertical single-acting, four-stroke, medium-speed engine—it is direct-connected to an electric generator, and at the other end, forming what looks like a fifth cylinder, is an air compressor. White-uniformed attendants and the general cleanliness are noteworthy. W. S. Heger, Pacific Coast representative, is in charge.

Cambria Steel Company, Johnstown, Pa. Shows the Kelly steel converter that was used at the Cambria Iron Works in 1861 to 1862 and which is labeled "THE PIONEER CONVERTER OF AMERICA." Among the exhibits are rolled automobile shapes, structural sections, bars, wire products and agricultural implements. A carbon steel axle is shown bent cold. E. H. Bankard, Jr., of the Chicago office of the company, is in charge, and the exhibit is in the Palace of Transportation.

Cantrell-Miller Machine Works, San Francisco, shows an oil retainer for use with rapidly revolving machines, such as grinders.

Carborundum Company, Niagara Falls, N. Y. A highly educational display, which includes an amazing display of articles made with the aid of carborundum products and samples of results of grinding by carborundum and aloxite. A solid vitrified grinding wheel, 78 in. in diameter, is shown. Products are also shown in space given over to New York State in the Palace of Mines and Metallurgy.

Carboy Inclinator Company, New York City. Device for transporting carboys of acid shown in the Collective Insurance and Universal Safety Exhibits, Palace of Mines and Metallurgy.

Challenge Machine Company, Philadelphia. Grinder shown by Fred Ward & Son, Inc., San Francisco.

Chisholm & Moore Mfg. Company, Cleveland. Overhead traveling cranes and hoists; display chiefly of chain trolley hoists. Represented by Berger & Carter Company, San Francisco, H. K. McJunkin, expedition manager.

Cincinnati Iron & Steel Company, Cincinnati. Three Cisco lathes shown by Harron, Rickard & McCone, San Francisco.

Cincinnati Pulley Machinery Company, Cincinnati. Drill press with clutch and shafting protection shown in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Cowan Truck Company, Holyoke, Mass. Besides hand lifting trucks for industrial plants, the transveyor built by the Automatic Transportation Company is shown. J. A. Murray is in charge.

Crane Company, Chicago. A large display of valves and piping and fittings formed partly as a fencing for the exhibit space. A 72-in. valve with hydraulic cylinder is one of the operating exhibits, this weighing 56,000 lb., and there is a working exhibit of Crane tilting traps connected with an electrically heated boiler, rigged to indicate how they may be used as hot water meters. Many of the large valves exhibited are mounted in section to show operation. F. J. Busch is in charge for C. W. Weld, manager of the San Francisco branch.

Crescent Machine Company, Leetonia, Ohio. Woodworking machinery. Exhibit in charge of the A. L. Young Machinery Company.

Cumberland Steel Company, Cumberland, Md. Shafting exhibited by the Meese & Gottfried Company.

Cutler-Hammer Mfg. Company, Milwaukee. A working exhibit of a lifting magnet in the space of the Shepard Electric Crane & Hoist Company.

Dannemora Steel Works, Sheffield. Exhibit of tool steels shown by Fred Ward & Son, Inc., San Francisco.

Davis-Bournonville Company, New York. Shows in an instructive exhibit how different metals are welded together,

gives visible proof of the speed with which large steel forgings, for example, may be cut through by the oxy-acetylene torch and shows the oxygraph and the radiograph, which have been described in these columns. The exhibit brings out how 4000 ft. of 16-in. pipe was welded by the oxy-acetylene process. William Joyce, engineer for the company, and T. W. Taggart, who represents the company on the Pacific coast, are in charge, and exhibit is in the Palace of Manufactures.

Thomas Devlin Mfg. Company, Philadelphia. Shows malleable iron fittings, sprocket wrenches and S type wrenches, as well as hardware articles, in Palace of Manufactures.

Diamond Clamp & Flask Company, Richmond, Ind. Belt shifter shown in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Diamond Expansion Bolt Company. Product shown in the exhibition of the Western Electric Company, Palace of Manufactures.

Henry Disston & Sons, Philadelphia. A striking exhibit, in the Palace of Manufactures, including a large horizontal revolving saw, on which are mounted Keystone shaped displays of saws, saw tools, files and numerous other tools. D. W. Jenkins, Western sales manager, in charge.

Charles F. Elmes Engineering Works, Chicago. Jointer guards shown in the exhibit space of the Aetna Life Insurance Company. Palace of Mines and Metallurgy.

Falk Company, Milwaukee, Wis. Speed-increasing gear of the herringbone type shown in operation in the exhibit of the Pelton Water Wheel Company.

J. A. Fay & Egan Company, Cincinnati, Ohio. Wood shapers and band saw guards shown in the exhibit of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Fess System Company, Inc., San Francisco. Oil-burning system applied to house heating boilers and furnaces.

General Electric Company, Schenectady, N. Y. An exhibit, in Palace of Manufactures, in contributions to the industrial world, which is of a highly educational character. Samples of transformer steel are shown to indicate change of grain due to mechanical working; calorized and uncalorized iron pipe, heated in air for the same time and at the same temperature; copper cast with and without the aid of Weinstraub's boron flux (a matter of blow holes) with radiographs of a copper casting ¾ in. thick, also radiographs of a steel casting 9/16 in. thick; an exhibit of the Coolidge X-ray tube. A binal metal is also shown, comprising Monel metal and steel, also a resistance wire for heating purposes, comprising a central core of the resistance wire enclosed in a steel calorized tube with a packing of lime between the tube and the wire. Other special features include the modern manufacture of tungsten wire; fibrox, a product of the electric furnace and stated to be the most efficient high temperature installation known; the Arsem vacuum furnace for high temperature work, giving temperatures up to 3000 deg. C. for the manufacture for the argon lamp. The company has an interlocking fuse switch in the exhibit space of the Aetna Life-Insurance Company, Palace of Mines and Metallurgy, and a 1-ton storage battery truck with trailer in the Palace of Transportation.

This View of Part of the Fine Arts Palace Will Give Some Idea of the Exposition Architecture

Joseph Dixon Crucible Company, Jersey City, N. J. Products referred to in the exhibit of New York State in the Palace of Mines and Metallurgy.

Dodge Mfg. Company, Mishawaka, Ind. An elaborate exhibit, in charge of W. B. Hosford, first vice-president, with educational features to indicate varying frictional resistances in bearings. Besides safety clutches and cast-iron, wood and wrought-steel pulleys of various descriptions, the exhibit includes a rope drive, various forms of conveying apparatus, rolling mill pillow blocks and safety devices such as one for stopping machinery when a loose strand of a rope appears. A water softener and purifier is also shown.

Dreis & Krump Mfg. Co., Chicago. One machine exhibited is a steel motor-driven brake, 12 ft. long, capable of bending ⅜-in. plate, shown in operation. Other machines include an 8-ft. hand brake to bend No. 18 gage, a steel box and pan bending brake, a 10-ft. brake. Ed. Dreis, secretary of the company, is in charge.

S. R. Dresser Mfg. Company, Bradford, Pa. Shows couplings for high-pressure fire protection water systems, Palace of Manufactures.

Eastern Machinery Company, New Haven, Conn. Shows a mill cinder crusher for use in brass foundries, and also a clutch. George P. Stephan, Jr., in charge, Palace of Varied Industries.

Economy Engineering Company, Chicago. Shows a portable elevator capable of lifting 2000 lb. 7 ft. 5 in., so that it may take the load from a portable works truck and lift it any height, as to shelving of storage bins. Mailler Searles, Pacific coast agent, in charge.

Edison Storage Battery Company, Orange, N. J. Exhibit shows construction of the battery. Represented by W. J. Marland, San Francisco. The company is also exhibiting in Transportation Palace.

Geometric Tool Company, New Haven, Conn. Exhibit in Palace of Varied Industries, of cutting internal and external screw threads, also to be noted in the exhibit of Warner & Swasey Company in the Machinery Palace. George P. Stephan, Jr., in charge.

Glauber Brass Mfg. Company, Cleveland. Among other things a drinking fountain suitable for industrial establishments, shown in the Palace of Manufactures.

Gould & Eberhardt Co., Newark, N. J. Gear hobbing machine and shaper shown by Fred Ward & Son, Inc., San Francisco.

L. F. Grammes & Sons, Allentown, Pa. Wood shaper guards are shown in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Grant Mfg. & Machine Company, Bridgeport, Conn. Riveting machine shown by Harron, Rickard & McCone, San Francisco.

Graton & Knight Mfg. Company, Worcester, Mass. Exhibits a compact group of drives, constructed by William Sellers & Co., Philadelphia, to show wood-planer, cotton machinery and other combinations likely to be trying on

the durability of leather belting. A roll of 84-in., 3-ply belting requiring the hides of nine steers for 4 ft. 4 in. of length of belt is shown, and types of round twisted belts and belts for grooved pulleys as well as the use of parts of hides for harness parts, shoe counters, hydraulic packing, bicycle saddles, etc. A testing device shows belt subjected to water and to high temperature. Those in charge are A. McLean, H. C. Nelson and E. E. Bosworth, manager of the San Francisco branch.

Great Western Cutting & Welding Company, Inc., San Francisco. Exhibit includes seamless containers, repaired castings and oxy-acetylene cutting machine involving a long hand-driven screw on which is a traveling head holding the burner. F. W. Clifford is in charge.

Hammacher, Schlemmer Co., New York. Set screws shown in the Collective Insurance and Universal Safety Exhibits, Palace of Mines and Metallurgy.

Hanchett Swage Works, Big Rapids, Mich. Shows machinery for grinding saws and retoothing saws in connection with the exhibit of E. C. Atkins & Co., Indianapolis. R. V. Hanchett, treasurer, is in charge, Palace of Manufactures. The company's saw grinders, one in operation grinding the Simonds inserted wood cut-off saw and another operating on E. C. Atkins band and other saws, are shown in Machinery Palace.

Han Yeh Ping Iron, Steel & Coal Co., Ltd. Particulars are given in an exhibit in the Palace of Mines and Metallurgy, of coal from the Pinghsiang colliery, and sections of beams, channels, angles, rails, bolts, spikes and rivets made by the company are also shown. The washed nut coal, it is explained, runs 11 per cent ash; the coking coal 9 per cent; soft lump coal 10 per cent; hard lump 5 to 6 per cent; standard coke 11 per cent; coke from native beehive kilns 11 per cent.

Harrington & King Perforating Company, Chicago. Shows machine and belt guards in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Harrison Safety Boiler Works, Philadelphia, Pa. This exhibit, incorporated in that of Harron, Rickard & McCone, shows some steam plant auxiliaries, one of which is denominated as the cash register of the coal pile. This Cochrane apparatus includes the V-Notch recorder, with the use of glass ports to observe the operation, and the company's multiport relief valve.

Harron, Rickard & McCone, San Francisco. A collective exhibit of various manufacturers of machine tools and mining machinery, mentioned elsewhere under the names of the manufacturers. Represented by Richard Cederberg, Tracy Harron and M. A. Knapp.

Hartford Machine Screw Company, Hartford, Conn. In exhibit of General Electric Company, Palace of Manufactures, is shown an electrically driven garage pump.

Haslett Spiral Chute Company, San Francisco. An operating exhibit of package conveying apparatus, with emphasis on chutes and roller tables or gravity slides. H. C. Parrish in charge.

Hauck Mfg. Company, Brooklyn, N. Y. Kerosene torches in four sizes; portable oil burners for crude oil or distillate, one compressed air type and one of the hand pumping types; a portable rivet heating furnace with preheating chamber on top and with arrangements for air curtain at the working front of the furnace; a tire heater; lead and babbitt melting furnaces with portable burners and burners for brazing and for use in coppersmith shops. Herman Kittel is in charge.

Henderson-Willis Company, San Francisco. Oxy-acetylene, cutting and welding, showing samples of work done with apparatus of the Henderson-Willis Welding & Cutting Company, St. Louis.

Hoggson & Pettis Mfg. Company, New Haven, Conn. Has the Sweetland chucks on display and stencil cutters, embossing molds as for rubber work, in the Palace of Varied Industries. George P. Stephan, Jr., in charge.

Hoppes Mfg. Company, Springfield, Ohio. Feed water heater shown by L. D. Armstrong, San Francisco.

E. Horton & Sons Company, Windsor Locks, Conn. Chucks shown by Fred Ward & Son, Inc., San Francisco.

A. F. Howe, Granite City, Ill. Saw and jointer guards are shown in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Humason Brothers, Youngstown, Ohio. Safety guards shown in exhibit of Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Hydraulic Pressed Steel Company, Mt. Gilead, Ohio. Exhibit includes a 14-stroke pump with 1½-in. plungers for 2000 lb. pressure; a wheel press and a pipe bender for pipe up to 4 in. diameter. Represented by Berger & Carter Company, San Francisco, H. K. McJunkin in charge.

Imperial Steel Works, Japan. A model of the works at Seitetsujo Yawata Chikuzen, Japan, is shown in the Japanese exhibits in the Palace of Mines and Metallurgy. The shapes, bars and rails rolled are also shown.

Industrial Instrument Company, Foxboro, Mass. An educational exhibit of the Foxboro indicating and recording gages for pressure, speed, temperature, water levels and the like. A special demonstration apparatus has been worked up to show the operation of the various instruments. A. F. Mundy, San Francisco representative, and Carl Sullivan are in charge. The company has also a working exhibit measuring the gas used in the Collective Gas Exhibit in the Palace of Manufactures.

International Acheson Graphite Company, Niagara Falls, N. Y. Graphite in form of large electrodes is the conspicuous feature, shown by Fred Ward & Son, Inc., San Francisco.

International Acheson Graphite Co. Product shown in the New York State space in the Palace of Mines and Metallurgy.

Jesse A. Jackson, Oakland, Cal. Saw guard shown in exhibit of Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Joyce-Cridland Company, Dayton, Ohio. Jacks of various kinds shown by Harron, Rickard & McCone, San Francisco.

Kamaishi Iron & Steel Works, Japan. Exhibit in the Palace of Mines and Metallurgy includes charcoal wood coke, pig iron and bars, shapes and rails and cast iron pipe of 3 to 36 in. diameter.

King Machine Tool Company, Cincinnati. Belt shifter shown in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Julius King Optical Company, New York City. Exhibits safety goggles in the space taken by the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

H. Koppers Company, Pittsburgh. Has a model of its by-product coke oven and shows samples of by-products in the Collective Gas Exhibit in Palace of Manufactures.

Krogh Mfg. Company, San Francisco. Exhibits centrifugal and turbine pumping machinery ranging from a 1-in. pump for 20 gal. per min. to one having a capacity of 30,000 gal. per min.

Lagonda Mfg. Company, Springfield, Ohio. Among the specialties shown, some of which have recently been illustrated in these columns, may be mentioned a steam or air-driven tube cleaner, a multiple water strainer, an oil and grease extractor for boiler feed water, a reseating machine for grinding the caps and headers of Babcock & Wilcox boilers. It is represented by Chas. C. Moore & Co., San Francisco, Pacific coast agents.

Landis Tool Company, Waynesboro, Pa. Shows a universal and crank shaft grinders, motor driven for operation, and a 6 x 18-in. grinder. Represented by Harron, Rickard & McCone, San Francisco.

Lea Courtenay Company, New York City. Cold metal saw, equipped with motor drive for exhibition operation. Represented by Harron, Rickard & McCone, San Francisco.

R. K. LeBlond Machine Tool Company, Cincinnati. Shows cone belt shifter in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy, and also has an exhibit of a garage lathe in connection with the General Electric Company in the Palace of Manufactures.

Linde Air Products Company, New York. Has an exhibit in the Collective Gas Exhibit in the Palace of Manufactures.

Link Belt Company. A special display exhibited by the Meese & Gottfried Company to show the action of link belts in operation.

Lockhart-Hodge Company, Inc., Buffalo, N. Y. Saw guards shown in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Luitwieler Pumping Engine Company, Rochester, N. Y. Notable working exhibit of the non-pulsating drive to power pumps, including a 20-hp. triplex horizontal double-acting pump and a 5-hp. size. Represented by the Simonds Machinery Company, San Francisco, J. F. Jeffrey in charge.

Lunkenheimer Company, Cincinnati, Ohio. Exhibit is an impressive array of sizes and types of steam and other valves now regularly in demand. One of the valves is of crucible steel with Monel metal stem and nickel bronze seats, and built to withstand 350 lb. pressure and 800 deg. temperature. Considerable attention is paid to iron-body valves. H. F. Bakemeyer is in charge.

MacLeod Company, Cincinnati. Large variety of apparatus, including heating and melting industrial furnaces, sand blasting machines, portable rivet forges, oxy-acetylene apparatus with portable outfits for conveying containers. Represented by the Berger & Carter Company, San Francisco. H. K. McJunkin in charge.

Malleable Iron Fittings Company, Branford, Conn. Shows various pipe fittings, socket wrenches, etc., in Palace of Varied Industries. George P. Stephan, Jr., in charge.

W. J. Marland, San Francisco. Exhibits the products of a large number of companies mentioned elsewhere under company names.

Maryland Steel Company, Sparrows Point, Md. Exhibits in connection with the Pennsylvania Steel Company.

McCaffrey File Company, Philadelphia. Exhibits files in the Palace of Manufactures.

McIntosh & Seymour Corporation, Auburn, N. Y. Besides a steam engine a 4-cylinder vertical Diesel engine of 600-hp. capacity is shown.

McNutt Can Sales Company, New York City. Shows a non-explosive gasoline can in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Medart Patent Pulley Company, St. Louis, Mo. Exhibit incorporated in that of the Advance Pump & Compressor Company.

Meese & Gottfried Company, San Francisco. An extensive exhibit of conveying, elevating, screening and mechanical power transmitting machinery. Among the exhibits may be mentioned a barrel elevator; belt-driven centrifugal pump; a helical conveyor in steel trough; shaft bearings; Gilbert wood split pulleys; line shaft showing quill construction with Pioneer pressed steel hangers, pressed steel shaft collars, a 9-ft. steel rim split pulley, friction and jaw clutches, take-up bearings, etc. Some of the exhibits of individual companies are referred to elsewhere.

Merrit & Co., Camden, N. J. Steel lockers. Represented by W. J. Marland, San Francisco.

Meurer Bros. Company, Brooklyn, N. Y. Among other things, shows a striking display of sheet metal roofing in the form of tiling, and also samples of steel barrels made by the Meurer Steel Barrel Company. A. H. McDonald, Pacific coast manager, in charge, Palace of Manufactures.

August Mietz, New York. Various sizes and styles of Mietz & Weiss oil engines. One of 50 hp. is operating on California fuel oil; one of 200 hp. with reversible gear desirable for ship propulsion, and one of 75 hp. of the 3-cylinder vertical type direct connected to a Fort Wayne generator.

Millers Falls Company, Millers Falls, Mass. A two-speed bench drill and polishing head, chucks and grinder wheels, arranged for visitors to operate. Ralph O'Connor, in charge, Palace of Manufactures.

Minnesota Manufacturers' Association, North St. Paul, Minn. An exhibit in charge of H. C. Christiansen, showing various systems for transporting articles, such as roller tables, chutes and chain and bar conveyors on a galvanized steel wearing trough and a continuous elevator for direct lifting.

Mitsui Mining Co., Japan. Shows zinc, lead, coke and by-products in the Japanese exhibit in the Palace of Mines and Metallurgy.

Mitts & Merrill, Saginaw, Mich. Keyseater, shown by Fred Ward & Son, Inc., San Francisco.

Moran Flexible Joint Company, Louisville, Ky. Universal steam piping joints and barrel fillers. Represented by W. J. Marland, San Francisco.

Morrison Safety Ladder Suction Grip Company, Lowell, Mass. Shows safety shoes for ladders in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Morton Mfg. Company, Muskegon Heights, Mich. Draw cut machine tools.

Insurance Company, Palace of Mines and Metallurgy, and of the Universal Safety Exhibits, same building.

James Ohlen & Sons Saw Mfg. Co., Columbus, Ohio. Case of saws shown by Fred Ward & Son, Inc., San Francisco.

Oliver Machinery Company, Grand Rapids, Mich. Jointer guard shown in exhibit of Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Tinius Olsen Testing Machine Company, Philadelphia. An elaborate collection of testing machines in operation, including a 150,000-lb. autographic machine for tension, compression, shear and transverse testing; a torsion machine of 200,000-lb. capacity; a spring testing machine; a wire testing machine; an Upton-Lewis toughness testing machine for materials subjected to alternating loads; hardness and impact machines; oil, cloth, file and cement testing machines and a machine for ascertaining the efficiency of drills, saws, reamers, dies, milling cutters and other metal cutting tools. E. L. Peck in charge.

Orange Caliper Company, Orange, Mass. Case of products shown by Fred Ward & Son, Inc., San Francisco.

Oriental Emery Company, New Haven, Conn. Exhibit in Palace of Varied Industries of abrasive stones from Naxos, Greece, and from Turkey in Asia.

Oster Mfg. Company, Cleveland, Ohio. Two power-

INTERNATIONAL JURY OF AWARDS, DEPARTMENT OF MACHINERY EXHIBITS

From left to right, standing: Capt. B. C. Bryan, U. S. N., director of navy yards, Navy Department, Washington, D. C.; Fred R. Low, editor *Power*, New York; John Hunter, chief engineer of power plants, Union Electric Light & Power Company, St. Louis; Capt. C. A. McAllister, engineer-in-chief, U. S. Coast Guard, Treasury Department, Washington, D. C.; Fritz J. Frank, secretary THE IRON AGE, New York; D. S. Watkins, assistant superintendent of shops, Southern Pacific Company, Sacramento, Cal.; William H. Crosby, president Crosby Company, Buffalo, N. Y.; Cecil P. Poole, consulting engineer, Atlanta, Ga.; Dr. Carl Hering, consulting engineer, Philadelphia; Harry W. Bringhurst, fire marshal, Seattle, Wash.; Thomas Morrin, consulting engineer, San Francisco; Prof. William H. Kavanaugh, Department of Experimental Engineering, University of Minnesota, Minneapolis; Jesse M. Smith, consulting engineer, New York; N. A. Bowers, Pacific Coast Editor, McGraw Publishing Company, San Francisco.

From left to right, seated: Prof. H. Wade Hibbard, Department of Mechanical Engineering, University of Missouri, Columbia, Mo.; Prof. C. E. Lucke, Department of Mechanical Engineering, Columbia University, New York; Prof. John T. Faig, Department of Mechanical Engineering, University of Cincinnati, Cincinnati; J. C. Mengel, master mechanic, Pennsylvania Railroad, Altoona, Pa.; George W. Dickie, consulting engineer, San Francisco; Lieut. G. W. Danforth, chief Department of Machinery, Panama-Pacific International Exposition; William H. Onken, Jr., managing editor *Electrical World*, New York; Prof. C. M. Jansky, professor of electrical engineering, University of Wisconsin, Madison, Wis.; George M. Brill, mechanical engineer, Berkeley, Cal.; Emil S. Fischer, San Francisco, appointed by the Chinese Commission; Calvin W. Rice, secretary American Society of Mechanical Engineers, New York.

H. Mueller Mfg. Company, Decatur, Ill. Shows in the Palace of Manufactures a foot-operated drinking fountain suitable for factory use and gas and water tapping machines as well as regulators for gas, water, air and steam pipe lines.

National Malleable Castings Company, Cleveland. Besides railroad couplers, a display of small and intricate castings and castings of electric steel in the Palace of Transportation. John H. Jaschka, sales agent, San Francisco, is in charge.

Nelson Valve Company, Philadelphia. Display of valves. Represented by W. J. Marland, San Francisco.

Neverslip Safety Clamp Company, New York City. Device for handling steel plates shown in exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy, and in the Collective Insurance and Universal Safety Exhibits, same building.

New London Ship & Engine Company, Groton, Conn. Shows a 180-hp., 4-cycle oil engine driving machinery in the exhibit of the Pelton Water Wheel Company through Falk speed-increasing gearing.

Niagara Machine & Tool Works, Buffalo. Exhibits among other things an inclinable press with safety device to protect the operator's hands; a motor-driven shear for material ¾ in. thick; a combined circular shear and flanging machine taking material of No. 10 gage and flanging 1½ in.; equipment for heading and flanging No. 12 gage material for steel barrels, and numerous hand, bench and tinners' tools. W. L. Lautz is in charge.

Norton Grinding Wheel Company, Worcester, Mass. Wheel guard shown in exhibit space of the Aetna Life

driven and one hand-driven pipe-threading machines are shown, as well as hand die stocks. Represented by Harron, Rickard & McCone, San Francisco.

Otis Elevator Company. Besides an automatic push-button control elevator serving the administration officers of Machinery Palace above its exhibit space, the operating head work of an alternating-current variable speed worm gear traction elevator is shown and also 2:1 gearless traction and 1:1 gearless traction machines. A. J. MacNicoll in charge.

Oxweld Acetylene Company. Shows sections of burners and generator in the Palace of Manufactures.

Pacific Wire Rope Company. Products exhibited in exhibit of Lucey Mfg. Corporation.

Pennsylvania Flexible Metallic Tubing Company, Philadelphia. Steel and copper flexible tubing for steam and oil from ¼ to 8-in. in diameter is shown and also an automatic barrel filler. F. A. McDonald is in charge.

Pennsylvania Steel Company, Steelton, Pa. A highly instructive exhibit in the Palace of Transportation. Among other things are shown a part of the Panama Canal steel track for towing locomotives; rails and rail joints, which show how the Baltimore & Ohio 120-lb. open-hearth rails, the Pennsylvania 100-lb. open-hearth rails and Mayari steel and other bolts withstood drop tests; a 1¼-in. Mayari frog bolt turned down to ¼-in. diameter and sustaining a load of 2345 lb. pig iron corresponding to 192,500 lb. per sq. in. of the bolt metal; a hatchet of Mayari steel made by the Germantown Tool Works, and subjected to cutting tests; small intricate castings of gray iron containing 5 per cent Mayari iron, and samples of nickel chrome steel used in the Memphis

bridge and of Mayari shovels and heat treated spring steel. One of the instructive features is a diagram in model form to show the scheme of operations at the plant of the Maryland Steel Company covering the burden of the blast furnace and the products of the furnace and their utilization in open furnaces, converters and the duplexing process. The exhibit is in charge of Richard Knibloe.

Permutit Company, New York. Exhibits a water softening filter for boiler plants and household use in the Palace of Liberal Arts. Guy H. Newcomb, San Francisco, agent in charge.

Pneumercator Company, New York City. Apparatus for registering depth and volume of contents of tanks, etc. Represented by James C. H. Ferguson, San Francisco.

W. S. Ray Mfg. Company, San Francisco. Crude oil burners with motor driven blower for burning oil of 16 Beaume gravity for annealing ovens and other purposes. Represented by Alfred Hoppen.

Reed Mfg. Company, Erie, Pa., display of vises, hand pipe cutters, etc. Represented by W. J. Marland, San Francisco.

P. H. & F. M. Roots Company, Connersville, Ind. Shows a blower engine driven in space under charge of Harron, Rickard & McCone, in Palace of Manufactures.

Rusknot Company, Inc., Oakland, Cal. Exhibit of a rust preventive for metals in space of W. J. Marland. Represented by James E. Galligan, manager.

Safety Power Transmission Company, Brooklyn, N. Y. Metal shaft guards are shown in the exhibit space of the Aetna Life Insurance Company. Palace of Mines and Metallurgy.

St. Louis Steel Foundry, St. Louis. Solid manganese railroad crossing and frogs and switches. Represented by Parrott & Co., Pacific coast agents.

Sangamo Electric Company, Springfield, Ill. Shows, among other things, an electro plating meter.

Charles A. Schieren Company, New York. Besides the illuminated working exhibit already illustrated in these columns, to prove the efficacy of belting for transmission in close quarters and around corners, including the use of gravity idlers, the exhibit also shows the American patent leather link belting for difficult situations. Charles E. Basler is in charge.

Schneider & Co., Creusot, France. Showing in the Palace of Manufactures, among other things, the 75-millimeter gun of the French army.

Semet-Solvay Company, Syracuse, N. Y. Shows, in the Palace of Manufactures, by means of a glass cube, the 31 cu. ft. of surplus gas available for sale by the coking of 10 lbs. of coal in its byproduct oven. Within the cube is shown the additional products, such as 7.38 lb. of coke; 0.117 lb. of ammonium sulphate; 0.042 gal. of tar and 0.013 gal. of crude benzol.

Seneca Falls Mfg. Company, Seneca Falls, N. Y. Never-stop chuck in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Sentinel Mfg. Company, New Haven, Conn. Shows an automatic gas heater for soldering irons and the like. George P. Stephan, Jr., in charge, Palace of Varied Industries.

Shepard Electric Crane & Hoist Company, Montour Falls, N. Y. By means of a frame work of cast-iron columns and I-beams, it shows the operation of an electric traveling crane; of a trolley with operating cab traveling in suspension from an I-beam; of floor controlled overhead trolley cranes, and of an electric winch for hoisting and other operations. The exhibit includes a Cutler-Hammer lifting magnet. Represented by Berger & Carter Company, San Francisco, H. K. McJunkin in charge.

Shore Instrument Company, New York City. A new type of scleroscope is shown as well as the durometer and elastometer, the latter two specially for rubber testing, and a pyroscope for indicating high temperatures. F. G. Kendall, sales manager, is in charge.,

E. C. Simmons Hardware Company, St. Louis. An exceedingly elaborate exhibit is in the Palace of Manufactures in the nature of a moving window display showing the numerous products of the company. It is impracticable to attempt to outline this, but mention could be made of a clock tower with large size figures of workmen who by means of sledges strike the hour on anvils.

Simonds Mfg. Company, Fitchburg, Mass. An educational exhibit of the condition of the contents of crucibles for every hour in the manufacture of crucible steel. Other points on the manufacture of saws. Exhibit in Palace of Manufactures.

Smith & Mills Company, Cincinnati, Ohio. Exhibits two shapers in operation. Represented by Harron, Rickard & McCone, San Francisco.

Société des Etablissements Delaunay Belleville, St. Denis-sur-Seine, France. Exhibits valves, pyrometers, parts of steam boilers, etc., in Palace of Manufactures.

Société Générale de Constructions Mecaniques, formerly E. Garnier & Faure, Beaulieu, shows the Rateau steam turbine and apparatus, centrifugal blowers and pumps, gas and Diesel engines, etc., in the Palace of Manufactures.

Standard Gas Engine Company, San Francisco. Exhibit of vertical engines of one to four cylinders, from 4 to 175 hp. capacity. C. C. Kriemler in charge.

Standard Oil Company. In an exhibit of large proportions in the Palace of Mines and Metallurgy, coal dust briquettes about 3 in. in diameter and 3 in. long are shown, pressed into shape with about 7 per cent of petrolastic cement. It is explained that the coal dust develops 9000 B.t.u. per pound and the binder about 16,000 B.t.u.

Standard Pressed Steel Company, Philadelphia. Safety set screws are shown in the exhibit of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Stanley Works, New Britain, Conn. Cold rolled strips of steel as used for stamping purposes are shown in the Palace of Manufactures, and also garage fixtures. Represented by Roy A. Barnes.

Sterling Wheelbarrow Company, Milwaukee, Wis. An exhibit of metal foundry flasks and trucks. Represented by Harron, Rickard & McCone, San Francisco.

Stockbridge Machine Company, Worcester, Mass. Shows a motor driven shaper in the exhibit of Harron, Rickard & McCone.

Strong, Carlisle & Hammond Company, Cleveland, Ohio. Shows safety set screws in the exhibit of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Sturtevant Mill Company, Harrison Square, Boston, Mass. Exhibits grinding and crushing machinery, part open to show the principles of operation. Included are: a rotary fine crusher; a miniature of a giant ring-roll pulverizing mill that weighs 25 tons laboratory rolls, and a laboratory sample grinder. Represented by Harron, Rickard & McCone, San Francisco.

Sumitomo Copper Works, Osaka, Japan. Shows copper and brass sheets, tubes and ingots in the Palace of Mines and Metallurgy.

Sumner Iron Works, Everett, Wash. Show an 18 x 24-in. duplex balance valve steam engine.

Superior Corundum Wheel Company, Waltham, Mass. Products shown by Fred Ward & Son, Inc., San Francisco.

Surty Guard Company, Inc., Chicago. Saw guard shown in exhibit of Aetna Life Insurance Company, Palace of Mines and Metallurgy.

James Swan Company, Seymour, Conn. Exhibits wood bit and gimlets in the Palace of Manufactures.

Tempco Electric Motor Company, Leipsic, Ohio. Showing portable electric grinders, drills, buffers, etc. Represented by Berger & Carter Company, San Francisco. H. K. McJunkin, expedition manager in charge.

Templeton, Kenly & Co., Chicago. Safety jack shown in the Collective Insurance and Universal Safety Exhibits, Palace of Mines and Metallurgy.

Henry G. Thompson & Son Company, New Haven, Conn. Shows in the Palace of Varied Industries hack saws and metal sawing machinery, motor driven. In this exhibit also shown demonstrations of an American lathe of tool holders and other lathe tools invented by James Carr.

Trimont Mfg. Company, Roxbury, Mass. Shows the Trimo chain pipe wrenches, pipe cutters, etc., in the Palace of Manufactures.

U. S. Electrical Tool Company, Cincinnati, Ohio. Shows portable drills and grinders in the exhibit of Harron, Rickard & McCone.

United States Steel Corporation. Exhibits in the Palace of Mines and Metallurgy were illustrated in THE IRON AGE of April 1, 1915.

Venn Severin Machine Company, Chicago. Oil engines, one of 60 hp., shown in section, for inspection. Represented by Harron, Rickard & McCone, San Francisco.

Fred Ward & Son, Inc., San Francisco. Numerous machinery exhibits, mentioned under manufacturers' names. Stanley Durbrow in charge.

Warner & Swasey Company, Cleveland. An extensive exhibit of machine tools, most of them equipped for operation and used to demonstrate the kind of work and capacity of the machine. Among others may be mentioned an 18-in. swing turret lathe for general brass work; the company's 3A universal hollow hexagon turret lathe for general bar and chucking work; the No. 2A universal hollow hexagon turret lathe; a double head key lathe, semi-automatic; a screw machine for 1-in. stock; a 14-in. swing turret lathe; an automatic boring and tapping machine with four working heads; a screw machine of 2¼-in. capacity, and a universal screw machine. L. K. Goss is in charge.

Wells Bros. Company, Greenfield, Mass. Shows taps and dies in noteworthy variety in the Palace of Manufactures.

West Haven Mfg. Company, New Haven, Conn. Exhibit in Palace of Varied Industries saw blades and a universal hack saw machine, three of these machines working. George P. Stephan, Jr., in charge.

Western Gas Engine Corporation, Los Angeles, Cal. Shows gas and oil engines of 12 to 200 hp., and an unusual reversing gear. One of the engines drives a Byron-Jackson centrifugal pump which delivers to an illuminated fountain giving a spectacular mushroom form of waterfall. John R. Johnston, sales manager, in charge.

Western Tool Mfg. Company, Springfield, Ohio. Portable tool holders, light frame moulding bench, vise, hack saws, and also products made by J. H. Williams & Co. Represented by W. J. Kenney Mfg. Company, San Francisco.

Westinghouse Air Brake Company. Exhibit includes a 550-cu. ft. motor-driven air compressor, rigged with glass in the frames of the compressor to show the forced lubrication of the cylinders; a centrifugal compressor with a device for clutching the shaft when proper speed is reached, and pneumatic fresh water pumps. S. G. Down and C. W. Smith are in charge.

Westinghouse Electric & Mfg. Company. Besides an exhibition of electrical machinery, there are shown a LeBlanc low-level jet condenser with steam-turbine-driven condensing pump, a Westinghouse-Parson steam turbine opened to show the internal construction and mounted with a 625 kva. alternating-current generator and a 1-kw. 120-volt steam turbine unit operating at 4000 r.p.m.

George J. Willett, Milwaukee, Wis. Shows a belt shifter locking device in the exhibit space of the Aetna Life Insurance Company, Palace of Mines and Metallurgy.

Williams Tool Company, Erie, Pa. Exhibit includes a semi-automatic pipe nipple and bolt cutting machine; pipe machines for 2½ to 8-in. pipe, ¼ to 2-in. pipe and 1½ to 6 in. in diameter. Represented by Harron, Rickard & McCone, San Francisco.

J. H. Williams & Co., Brooklyn, N. Y. A revolving exhibit which is informative of the large number of prod-

...cts made by drop forging and side exhibits emphasizing particularly the tool holders with a cam vise principle, as recently described in these columns. A working equipment is included to show the processes of manufacture, comprising a Waterbury-Farrel drop hammer, together with a trimming press and an American gas furnace. Products may also be seen in exhibit of Western Tool Mfg. Company. F. F. Linde is in charge.

T. A. Willson & Co., Reading, Pa. Exhibits safety goggles in the space in charge of the Aetna Life Insurance Company, Palace of Mines and Metallurgy, and in the Universal Safety Exhibits, same building. A case of safety goggles is shown in the exhibit of Harron, Rickard & McCone.

Witherbee, Sherman & Co. A panorama of Mineville in the Adirondacks is given in the New York State exhibit in the Palace of Mines and Metallurgy. What is being done in mixing titanium and magnetites is explained.

R. D. Wood & Co., Philadelphia. Hydrants and a length of cast-iron pipe about 7 ft. in diameter. R. E. Allan in charge.

Workmen's Compensation Service Bureau, 18 East Forty-first Street, New York City. An exhibit of accident prevention work, in the Palace of Mines and Metallurgy. It represents an "association of stock, casualty and insurance companies primarily to determine correct rates for compensation insurance." The system developed by the Bureau, it is explained, involves the application of the schedule of debits for bad conditions and credits for good conditions and has been in use about a year in twelve states on 20,000 plants with a saving in the first year to the employer of about $2,000,000 in premiums, to society a corresponding number of lives and limbs. It sells a copy of a book on standardizing for safety. The Underwriters' Laboratories, Chicago, is affiliated with the bureau.

Yarnell-Waring Company, Philadelphia. Working exhibit of the V-notch for recording the flow of water as from a feed-water heater and a seatless blow-off valve. Represented by W. J. Marland, San Francisco.

Government Workers for Private Arms Plants

WASHINGTON, D. C., July 13, 1915.—Officials of the labor union with which the 1200 machinists at the Washington Navy Yard are affiliated declare that unless the cut of 8 cents per day, due to the division of the $240,000 bonus among a larger number of men, of which notice has been given by Secretary Daniels, is rescinded by President Wilson, the majority of the men will accept offers said to have been received by them from the Remington Arms Mfg. Company to go to work at its new plant at Chester, Pa. The new Remington plant will require the services at the start of at least 1000 men and within a short time 5000 will be employed in work on contracts which the company has secured and which, it is stated, will involve full-capacity operation for five years. The wages the company is offering are said by the labor leaders to range from 50 to 75 cents per hour, with much higher rates for highly trained men who have specialized in ordnance work. The Remington company is said to have already secured 250 men from the Frankford Government Arsenal at Philadelphia.

A representative of the Remington Arms Company is quoted as stating that the company has no intention of disorganizing the force at the Washington yard or elsewhere in the Government service. It is simply in the market for labor. The Navy Department is disposed to accept this statement in good faith, and the officials believe that the initiative in the transfer of machinists to the company's employ has been taken by the labor leaders, who have employed this opening as a cudgel with which to force Secretary Daniels and the President to come to terms.

The Empire Steel & Iron Company started up this month its Crane furnace No. 1 at Catasauqua, Pa., which had been banked for six months. In spite of this long period of banking the furnace started off well and has made its regular output of foundry iron for a number of days. No. 2 furnace at Catasauqua has been relined and will go in blast as soon as there is a demand for its product. The furnace of the company at Oxford, N. J., has had an unusually successful run, having made 250,000 tons of basic iron in the past three years on the present lining. The Oxford and Mount Hope (N. J.) mines are being operated in full and are shipping ore to the Empire Steel & Iron Company furnaces and to two merchant furnaces in eastern Pennsylvania. These mines have an output of 25,000 to 30,000 tons of magnetite per month.

New Alloys of Non-Ferrous Metals

For the past year or more the Garford Engineering Company, Elyria, Ohio, has been conducting experimental work and producing a new metal known as Aero metal. It has tried out this metal in a number of different fields and claims that the results obtained have been highly satisfactory. These different alloys have been used to a limited extent in England, but the Garford Engineering Company is the first one to produce them in the United States.

Aero metal consists of various light metal alloys, the combination being changed to meet different physical requirements. The most important factor in the production of the metal is the processes that permit the alloying of metals that ordinarily cannot be brought into a true alloy. The other factor is the combination of metals to secure desired results for different purposes. Among the desirable qualities attributed to the metal are its extraordinary strength, light weight and hardness in some cases and toughness in others and, in fact, the various physical properties that can be secured in the different alloys through the patented process that makes possible the alloying of metal that cannot be alloyed in the ordinary process. Another special feature of some of the alloys is the non-corrosive qualities. It is stated that the processes permit non-ferrous alloys being made with much greater uniformity than is possible in ordinary methods used in making aluminum and other alloys.

The experimental work and practices of the Garford Engineering Company have been along the line of handling non-ferrous metals more scientifically than has been the ordinary practice, the company believing that this is a very broad field and that progress will be made in handling these metals that will compare with the advance in producing steel alloys during the past few years. The company is now furnishing Aero metal in castings for replacing brass, bronze and iron and is also furnishing sheets and rods. The rods are being used quite extensively for making screws and other automatic screw machine products. The strength of the drawn rod is said to be equal to that of mild steel. Considerable interest is being shown by the automobile trade in Aero metal alloys for general use and especially for pistons where the specific gravity, strength and frictional qualities are said to be secured to such an extent that a large increase in power is possible as compared with the use of iron pistons.

This company has been carrying on extensive experiments in making die-castings from the different alloys including a number of high melting point alloys with a view of producing castings to finish having exceptional strength and density. At the present time Aero metal alloy castings are made in molds, the practices to some extent being along the usual lines, except in the melting and pouring of the metals.

Among the uses to which the metal is now being put are the construction of automobile and marine engines and railroad and trolley car fittings, for various purposes on battleships and submarines, for cooking utensils, for castings; for equipment used in packing, canning, dairy and chemical plants, also for portable machine constructions. It is claimed it can be used to advantage anywhere where a light strong metal is desired and that it is particularly adapted for all kinds of fittings and for replacing brass because it takes a high polish, which is retained on account of its hardness and non-corrosive properties.

The Garford Company has also recently worked out what it claims to be a very fine bearing metal, consisting of large percentages of copper and lead. It is stated that tests made with this bearing metal, especially in racing automobiles, and for other bearings where there is very severe wear, have proved the metal of exceptional value for bearings.

The stockholders of the Trumbull Steel Company, Warren, Ohio, will vote Aug. 6 on an increase in capital stock from $2,500,000 to $4,000,000. Some extensions will be made to the plant, but the report that the company intends to build an open-hearth steel plant for the production of sheet bars is officially denied.

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THE IRON AGE

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The Scarcity of High-Speed Steel

Tool-steel manufacturers find conditions in that market almost without a parallel. The supply of tungsten is practically the measure of the high-speed steel situation, and under the increasing scarcity of ferrotungsten, prices of the alloy and of steel in which it is used have gone soaring. From 60 cents a pound at the beginning of the war ferrotungsten had risen to more than $1 per pound of contained tungsten in April. In May $1.50 a pound was paid and in the past week as high as $2.50 is reported on a 10-ton transaction, while offers of that price for all that could be furnished have brought out very limited quantities. At the same time some sellers have continued to furnish the metal to their customers at $2 a pound, though their ability to make deliveries has definite limits.

Manufacturers of high-speed steel and all tool steels have advanced prices rapidly in the past two weeks. One important interest has announced a 50 per cent advance, and in the case of some steels the price has nearly doubled on orders from new sources. It is quite evident that some companies which have large orders for war munitions are far from being covered on their tool steel supply; also in turn that manufacturers of high-speed steels are facing a situation more acute than that which has prevailed in the trades dependent upon spelter, with the control of tungsten supply even more concentrated than in the case of spelter. Naturally high-speed steel scrap has become valuable and sales have been made at about three times the average price of last year, 18 cents a pound having been paid in the Central West.

The unprecedented demand for lathes and other machine tools and the large contracts for shells, which together are responsible for what is well-nigh a famine in tungsten steels, promise a continuance of the present demand for the latter for months, if not an increasing demand. No early relief is to be looked for through an increase in the supply of tungsten. Meanwhile something can be done in the substitution of other alloys, but at the sacrifice of the cutting power of tools. To some extent tool users may be forced before the year ends to take carbon steels and the self-hardening steels which were their dependence before the revolution in machine design brought by high-speed steel. In any event the indications are that calculations as to the number of machine tools and the amount of munitions that can be delivered this year on existing contracts must undergo a considerable revision.

What Is the Matter with Pig Iron?

The average price of pig iron in the United States is practically as low as it was in November and December. Meanwhile steel prices have scored advances averaging about $3 a net ton, and further advances in some products are definitely suggested by existing conditions in the steel market. Pig iron not only has not made a general advance, but has been betraying weakness in some quarters in the past fortnight.

There have been changes in pig-iron prices in the past eight months, since the continuous and marked decline came to an end, but they have been relatively unimportant. After a market drive in late October and early November Buffalo scored an advance, but all this and more too was given away in March, upon the occasion of a fresh drive, so that the second advance which has occurred since is not to be taken too seriously. The Chicago market has shown fluctuations of somewhat similar character. The eastern Pennsylvania market is at substantially the same level as last November, having done nothing to speak of except drop a quarter for a while after the March drive by the Buffalo furnaces. The Birmingham market dropped to $9.50 in December and then to $9.25 as minimum in March, recovering to $10 and then declining again.

The market in the Pittsburgh district has shown the most curious fluctuations. From November through the month of May there was practically no change in the openly quoted market. The Buffalo furnaces sold some iron in the Pittsburgh district in their March drive, but the general level of quotations, at least by the Valley furnaces, was not disturbed. Bessemer and basic iron appeared to stiffen slightly early in June and the Valley furnaces seemed to be getting into better position, but just at this time fresh weakness appeared in foundry iron, and even the Valley furnaces sold foundry iron at $12.50 at furnace, or less, when from 1904 to that time the quoted minimum in that market had been $12.75. Still more recently basic pig iron has been sold at an almost unheard of price, and the circumstances clearly indicated that

the Valley and detached western Pennsylvania furnaces are at this time exposed to vigorous competition from Lake front furnaces, and have before them the problem of determining whether the quantity of iron Lake front furnaces desire to dispose of in their territory is sufficient to justify their lowering the quotations to which they have hitherto adhered.

These are very curious conditions for the pig-iron market at a time when the steel industry is continuing to improve after a practically uninterrupted forward march for at least seven months. It is traditional in the trade that the foundries find increased activity at a later time than the steel works, when a general improvement is in progress, and that the pig-iron market lags behind the steel market. Earlier in the year the dictum furnished a sufficient explanation for the inertia of the pig iron market, but by the most liberal interpretation seven months is too long for pig iron to lag behind steel.

The opinion expressed in pig-iron circles six months ago, and perhaps as late as three months ago, was that market prices were being made by particularly low cost furnaces, and that there were practically no idle furnaces with similarly low costs. An increase in the demand, therefore, necessitating heavier production, would require the invitation of a higher price to bring idle furnaces into operation. This expectation has not been justified. It has not been necessary thus far to bid higher prices in order to bring idle furnaces into blast. The monthly blast-furnace statistics of THE IRON AGE show that the merchant-furnace production was 15,306 tons per day in November and 15,515 tons per day in December, these being the lowest rates since August, 1911, when there had been a drop to 15,030 tons a day. Each month since November has witnessed an increase in the merchant furnace production, a daily rate of 20,339 tons being attained in June, an increase of 33 per cent from the November rate. It is doubtful whether any member of the pig-iron trade would have admitted, last November, the possibility of production being increased by one-third without the stimulus of distinctly higher prices being offered for the product.

There is a disposition to suggest that the human element, rather than the physical element, enters into the failure of pig iron to advance in the circumstances; that some furnaces are making pig iron at a loss, simply because their owners desire to be in the business. It is to be remembered, however, that the merchant furnaces as a whole control a great deal more Lake Superior ore than they did in years gone by, when the price of ore fixed a limit to the price of pig iron, while furthermore Lake Superior ore is rather cheap in the open market, the announced prices being as low as those of 1914 and 1912. Coke has not materially increased in actual cost, despite the fact that the demand upon the Connellsville region has increased by 75 per cent or more since December.

Last October and November practically all business interests were in a slough of despond. If any market was looking upward it was doing so merely because it was flat on its back. There was no incentive for the merchant furnace to produce pig iron. Later, as prospects began to brighten more and more clearly, there came promise of better things in store. The disposition of furnace owners who blew in additional stacks evidently was that a better market was assured for the future, and there was no need to await its actual advent. It would be just as well to join the producing ranks at once, so as to make sure of being ready to participate in full measure in the improvement, whenever it should arrive. Evidently each furnaceman has anticipated the improvement to such an extent that he has helped to forestall it. Necessarily there would be a famine in pig iron now if there had been no increase in production.

The human element has evidently controlled, rather than the physical element. The increase in production evidently has not yet progressed to the point where the distinctly higher cost furnaces must be called upon to contribute to the supply. If that point could be predetermined it would be possible to predict what increase in demand is needed to advance the pig-iron market, not fractionally but quite sharply.

Wherever this interesting point may lie, it is quite certain the market will advance if even a small number of the large steel producers enter the market. That would materially increase the total demand, but apart from that it would have a sentimental influence of great importance. Evidently the merchant furnaces have been the reverse of hopeful up to the present time.

Recent high points in merchant-furnace production have been November, 1909, with a daily rate of 28,584 tons, and February, 1913, with a daily rate of 28,364 tons. Considering that in the 1912-3 movement there remained quite a number of idle merchant furnaces it is certain that the capacity in existence to-day exceeds 30,000 tons a day, so that the output in June, although representing an increase of one-third over the output of last November, is still fully one-third under the existing capacity. That some very considerable part of the present idle capacity, if not practically all, involves considerably higher production cost than that of the operating furnaces can hardly be doubted.

The Seamen's Law and Public Sentiment

The announcement comes from Washington that the President intends to make a careful study of the manner in which the seamen's law which is to go into operation November 4 will affect American shipping. He and his advisers have evidently been impressed by the declaration made by steamship companies, especially those operating on the Pacific Ocean, that they will either dispose of their ships by the date named or will transfer the registry of their vessels to foreign countries on the ground that it will be unprofitable to continue operating them under the United States flag when the provisions of this law go into effect. Not only are these vessel owners interested in the matter but business men all over the United States have been aroused almost to a state of indignation by this statute, which throttles American sea-going navigation interests at a time which is otherwise most propitious for building up an American merchant marine. Nothing that has happened for a long time has excited

so much general interest in a shipping question as this.

Possibly the sponsors of this ill-advised legislation may have built better than they knew. It may be the means of attracting such widespread attention to the shipping question that a body of public sentiment may be created in favor of genuine encouragement to sea-going shipping interests that will be irresistible. The fact that the President of the United States has announced himself as deeply interested in this matter is an assurance that some action may be taken which will not only annul this and other statutes which are now strangling our ocean-carrying trade but will also build up the merchant marine. The demagogues who have fostered their political interests by advancing impracticable labor legislation may have over-stepped themselves in this instance. It would be remarkable, indeed, but not out of line with experience, if a measure intended for one purpose should inadvertently accomplish far more in another and a more important direction.

CORRESPONDENCE

Uniform Cost Accounting

To the Editor:

It would appear to me that, in your account of the American Boiler Manufacturers' meeting at Erie, you have unintentionally allowed an inaccuracy to creep in this article, wherein you state, "It also recommended the apportionment of overhead as a percentage of the payroll or direct labor charge, instead of by one of the more modern and more accurate methods."

We did not recommend the method of apportioning overhead as stated, in preference to any better method, but rather we recommended this method in preference to several other methods which we found in vogue, and which in our judgment were inaccurate and misleading. Please be advised that the paper was prepared with the object of presenting one that would appeal to many concerns on account of its simplicity and being easily understandable. There was no intent of its being technical or scientific, as we considered that such a paper would defeat its own object.

Had your representative taken into consideration fully this paper as read, and the comments of our members as expressed on the floor after the reading, I believe that he would have better understood the object we were trying to attain, and that was to start an educational campaign among our members, and in boiler shops in general, wherein the best possible cost system would be introduced, commensurate to the needs of smaller and medium sized concerns.

HECTOR D. MACKINNON, President
MacKinnon Boiler & Machine Company.
Bay City, Mich., July 7, 1915.

American Engines for British Patrol Launches

The Sterling Engine Company, Buffalo, N. Y., manufacturer of motor boat engines, has shipped to London one 250-hp. 8-cylinder engine, one 100-hp. 6-cylinder engine, and one 50-hp. 4-cylinder engine for motor boat patrol launches and submarine destroyers for the British Government. These motor boats are to have a sea-going speed of upward of 30 miles per hour. It is stated large orders for motor engines are to follow. The company has two 300-hp. 8-cylinder engines completed and under test nearly ready for shipment. It has also an order just received for six 150-hp. 6-cylinder engines and one for four 200-hp. motor boat engines for the Italian Government to cost $12,000.

Large Shipbuilding Companies to Enter Submarine Field

It is formally announced that the Newport News Shipbuilding & Dry Dock Company of Newport News, Va., and the New York Shipbuilding Company of Camden, N. J., are about to go into the business of building submarines. These two large companies have asked Secretary Daniels of the Navy that the advertised opening on Aug. 2 of bids for the sixteen submarines authorized by the last Congress be canceled in order that they may submit bids. Mr. Daniels is quoted as saying that he regarded it of the highest importance to encourage the submarine industry, and that it would be good policy to give these two companies a chance to bid. The entrance of these two companies into the field will double the submarine capacity of this country.

Spain is reported to have ordered from the Fore River Shipbuilding Corporation, Quincy, Mass., a 750-ton submarine of the latest type now building for the United States.

Lewis Nixon's Standard Motor Construction Company, Bayonne, N. J., has taken a $5,000,000 order from the Elco Launch Company, a subsidiary of the Electric Boat Company, to build 500 eight-cylinder motors of 380 hp., which are to be installed in the 500 70-ft. launches being built by the Elco Launch Company for the British government.

Large Increase in the Steel Corporation's Orders

The Steel Corporation's monthly statement of unfilled orders on its books June 30, 1915, shows a total of 4,678,196 tons, as compared with 4,264,598 tons on May 31, 1915, an increase of 413,598 tons. The increase in May was 102,354 tons. March and April showed decreases of over 90,000 tons each. On June 30, 1914, the total was 4,032,857 tons, or 645,339 tons less than at the end of last month. The June 30 total is greater than has been reported since March 31, 1914. The following table shows the unfilled tonnage for each month beginning with the high point of Dec. 31, 1912:

June 30, 1915	4,678,196	Feb. 28, 1914	5,026,440
May 31, 1915	4,264,598	Jan. 31, 1914	4,613,680
April 30, 1915	4,162,244	Dec. 31, 1913	4,282,108
March 31, 1915	4,255,749	Nov. 30, 1913	4,396,347
Feb. 28, 1915	4,345,374	Oct. 31, 1913	4,513,767
Jan. 31, 1915	4,248,571	Sept. 30, 1913	5,003,795
Dec. 31, 1914	3,836,643	Aug. 31, 1913	5,223,468
Nov. 30, 1914	3,324,592	July 31, 1913	5,399,356
Oct. 31, 1914	3,461,097	June 30, 1913	5,807,317
Sept. 30, 1914	3,787,667	May 31, 1913	6,324,322
Aug. 31, 1914	4,213,331	April 30, 1913	6,978,762
July 31, 1914	4,158,589	March 31, 1913	7,468,956
June 30, 1914	4,032,857	Feb. 28, 1913	7,656,714
May 31, 1914	3,998,160	Jan. 31, 1913	7,827,268
April 30, 1914	4,277,068	Dec. 31, 1912	7,932,164
March 31, 1914	4,653,825		

Important Sale of Machine-Tool Business

Fairbanks, Morse & Co., Inc., 30 Church Street, New York, has acquired the business of the Neil Machinery Company. George E. Neil, formerly manager of the latter company, will take the managership of the Fairbanks-Morse machine-tool department. The agencies formerly controlled by the Neil Company will be taken over. They are as follows: Lees Bradner Company, Cleveland, Ohio; Kern Machine Tool Company, Hamilton, Ohio; Springfield Machine Tool Company, Springfield, Ohio; Colburn Machine Tool Company, Franklin, Pa.; Bridgeford Machine Tool Company, Rochester, N. Y. W. V. Gould, for many years with the Jones & Lamson Machine Company, has also associated himself with the machine-tool department of Fairbanks, Morse & Co.

The Universal Portland Cement Company is starting the erection of four buildings in connection with the plant of the Minnesota Steel Company, Duluth, Minn. The largest is the finishing mill, 90 x 165 ft., which will be erected this summer and is to be ready for operation late next fall. Construction work is to be rushed in order to have the plant ready for operation April 1, 1916.

TRADE COMMISSION ACTIVITY

Investigations of Unfair Competition and Price Maintenance—Helping Manufacturers to Find Costs

WASHINGTON, D. C., July 13, 1915.—Much important work is planned by the Federal Trade Commission in connection with a six weeks' tour of the country, upon which its members will start July 18 and during which numerous conferences with business men will be held. The first stop will be Chicago, where two days, July 19 and 20, will be spent. Detroit will be visited on July 21, Cincinnati on July 22, and Indianapolis on July 23. The commission will return to Chicago for six days and will then go to Minneapolis and St. Paul on the way to the Pacific coast, where hearings will be held in Spokane, Tacoma, Seattle, Portland, San Francisco, Los Angeles, and San Diego. The work of the commission will be divided into two parts: First, a series of hearings relating to the export trade combination problem; second, conferences with business men concerning questions that have arisen in connection with purely domestic business.

The commission is thoroughly convinced that there is no more important subject than that of combinations for the extension of foreign trade. Its findings will probably reach Congress some time next winter, if not at the beginning of the next session.

COMPLAINTS OF UNFAIR COMPETITION

The conferences with business men relating to domestic trade problems to be held during the tour have been arranged as the result of the receipt of a large number of complaints alleging unfair competition and other offenses under the law creating the commission. It has been thought that the most expeditious way of disposing of these complaints, which have been received chiefly from individual dealers and trade associations in the Middle and Far West, is to go into the communities interested and hold informal conferences for the purpose of getting at the facts and of presenting suggestions that may possibly obviate further proceedings. At Chicago a committee of 30 or 40 representatives of the National Association of Lumber Manufacturers will discuss various aspects of the anti-trust laws and will seek information as to the scope of the activities of trade associations within the spirit and letter of the statutes.

Many of the complaints that have reached the commission relate to the work of so-called voluntary trade organizations. Some of them have been received from individuals who claim to have suffered as the result of acts committed by officials of these associations. Others are from the officers of such associations who seek to know how far they can go in protecting their members. The reports of the Bureau of Corporations, which contain criticisms of trade associations, notably a recent report on the associations in the farm implement industry, have raised many doubts which it is felt the commission should clear up as soon as possible.

PRICE MAINTENANCE

Another important matter that will receive consideration on the tour is that of price maintenance. It is a question whether the inquiry now under way will be completed in time to enable President Wilson to make a recommendation concerning the passage of the Stevens bill, which is being strongly urged by the American Fair Trade League and other organizations of manufacturers and dealers. Complaints received by the commission indicate that price-cutting is a growing evil and there is no remedy under existing law in view of recent rulings of the United States Supreme Court.

"CONSTRUCTIVE HELP" TO BUSINESS MEN

The commission is planning some work designed to give "constructive help to business men" along certain important lines, according to a statement given out by Vice-Chairman Hurley. He says in part:

"One of these projects is to aid the business men of the country in obtaining the additional credits to which their business operations may entitle them. The second is to aid in establishing a standard system of bookkeeping and cost accounting. The commission has in mind dividing the country into zones and maintaining in each experts in accounting, costs and manufacturing upon whom manufacturers, merchants and business men may call for advice and assistance in establishing economies.

"Frequently a business man with a credit of a few hundred dollars at his bank, based wholly on personal grounds, could, if he could produce a reliable balance sheet, readily obtain several thousand dollars which would enable him to expand his business along sound lines.

"The fact must be admitted that in order to put a selling price on your products you must, if you be a manufacturer, first know exactly what it costs you to manufacture and sell them. We are now working on smaller margins and we must absolutely know what our goods cost.

"It is a fact well understood among business men that the general demoralization in a large number of industries has been caused by firms which cut prices, not knowing what their goods actually cost to manufacture, and the cost of selling, which is equally important, is almost wholly lost sight of."

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The Iron and Metal Markets

INCREASED STEEL OUTPUT

Steel Corporation Buys More Billets

Advance of $1 in Bars, Plates and Shapes—Basic Pig Iron More Active and Higher

A further increase in steel production has become necessary to keep pace with the continued expansion of demand. July developments have gone so far to strengthen the situation that steel manufacturers now speak with assurance concerning the remainder of the year. The one note of uneasiness is that called out by labor troubles at munitions plants under construction and by demands in some parts of the machine tool industry.

Following the announcement of an increase of 413,000 tons in the Steel Corporation's unfilled orders in June—a total that exceeded estimates in the trade—the corporation has started up four more blast furnaces and a considerable number of open-hearth furnaces, and this week's working schedules represent 90 per cent of its ingot capacity. The resuming blast furnaces are at Cleveland, Lorain, South Chicago and Pittsburgh. In addition the Riverside plant at Wheeling, W. Va., consisting of two blast furnaces and two Bessemer converters, idle for two years, has been ordered into commission. At the new Duluth steel plant, which it was the plan to complete by the spring of 1916, work has been put forward so that steel can be made in the latter part of November.

Further evidence of growing consumption is the purchase of outside steel by the Steel Corporation. It has now placed orders for 55,000 tons of billets with Eastern steel works, including the 15,000 tons reported one week ago, besides 15,000 tons divided among three Central Western companies, two in Ohio and one in the Pittsburgh district, making a total of 70,000 tons. As 80 per cent of its blast furnace capacity is now running, it is not expecting to buy pig iron in the open market.

New business this month has been at about the same rate as in June, when the Steel Corporation shipped nearly 40,000 tons a day and booked 54,000 to 55,000 tons a day. Its export business amounts to 10.000 tons a day.

An advance in bars, plates and structural shapes to 1.30c., Pittsburgh, for third quarter delivery was made by the Carnegie Steel Company and Illinois Steel Company on Tuesday, and a similar advance was announced at the beginning of the week by the Cambria Steel Company.

There is no end in sight to the bar tonnage required for shells, and buyers are looking farther ahead. Contracts covering one and two years are now proposed, one calling for more than 100,000 tons of rounds. The bar specifications of agricultural machinery makers have increased, and Chicago reports July resumption of such plants, whereas earlier plans looked to starting in September.

The delay in placing in this country Russian orders for 200,000 tons of 67-lb. rails has been largely a matter of terms. Some manufacturers have been unwilling to accept part cash and part deferred payments, but it is reported, without direct confirmation, that two Central Western steel companies have taken this business, one receiving 125,000 tons and the other 75,000 tons.

Prices for structural shapes and plates, while not sharing the strength of bars on their own merits, are firmer in view of the large demand upon open-hearth steel capacity. Eastern plate mills are running fuller, but in the Chicago district recent contracts have been at $1 to $2 a ton below the regular Pittsburgh basis.

The Bridge Builders and Structural Society's report shows that 80 per cent of the capacity of the bridge and structural shops was contracted for in June as against 61 per cent in May.

In pig iron the feature is the purchase of 40,000 to 50,000 tons of basic iron by a Youngstown steel company from a Cleveland furnace that is about to be started, the delivered price, $13, being below the present basis for Valley iron. A sale of 5000 tons of basic has been made at $13 at Shenango Valley furnace and one of 10,000 tons of Bessemer iron at $14, Valley furnace. On an export inquiry for 40,000 tons of Bessemer iron of special chemistry $15, Valley furnace, has been quoted. The Central Western situation in steel making iron is stronger. Foundry irons, however, have not shown corresponding firmness.

An embargo just laid by the British government on exports of high grade alloy steels comes just as tool steel manufacturers in this country are showing concern about the supply of tungsten for high-speed steel. Prices of ferrotungsten and of high-speed steels have risen sharply in the past week and the situation has become fairly acute.

Our London cable tells of fresh proposals to restrict ferromanganese exports, in view of reports that some metal has reached Germany.

A Comparison of Prices

Advances Over the Previous Week In Heavy Type. Declines in Italics

At date, one week, one month and one year previous

	July 14, 1915.	July 7, 1915.	June 16, 1915.	July 15, 1914.
Pig Iron, Per Gross Ton:				
No. 2 X, Philadelphia....	$14.25	$14.25	$14.25	$14.75
No. 2, Valley furnace....	12.75	12.75	12.75	13.00
No. 2 Southern, Cin'ti...	12.65	12.65	12.40	13.25
No. 2, Birmingham, Ala.	9.75	9.75	9.50	10.00
No. 2, furnace, Chicago*	13.00	13.00	13.00	13.75
Basic, del'd, eastern Pa..	**14.00**	13.75	13.50	14.00
Basic, Valley furnace....	**13.00**	12.65	12.65	13.00
Bessemer, Pittsburgh....	**14.95**	14.70	14.70	14.90
Malleable Bess., Ch'go*..	13.00	13.00	13.00	14.00
Gray forge, Pittsburgh...	13.45	13.45	13.35	13.65
L. S. charcoal, Chicago..	15.75	15.75	15.75	15.75
Billets, etc. Per Gross Ton:				
Bess. billets, Pittsburgh..	**21.00**	20.50	20.50	19.00
O.-h. billets, Pittsburgh..	**22.00**	21.50	20.50	19.00
O.-h. sheet bars, P'gh...	**22.50**	22.00	21.50	20.00
Forging billets, P'gh.....	27.00	27.00	26.00	25.00
O.-h. billets, Phila.....	24.56	24.56	22.02	21.90
Wire rods, Pittsburgh...	25.50	25.50	25.00	24.50
Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia..	1.22½	1.22½	1.17½	1.17½
Iron bars, Pittsburgh....	1.25	1.25	1.25	1.25
Iron bars, Chicago.....	1.20	1.20	1.20	1.05
Steel bars, Pittsburgh....	1.25	1.25	1.20	1.10
Steel bars, New York....	1.419	1.419	1.369	1.26
Tank plates, Pittsburgh.	1.20	1.20	1.15	1.10
Tank plates, New York..	1.369	1.369	1.319	1.26
Beams, etc., Pittsburgh..	1.25	1.25	1.20	1.10
Beams, etc., New York..	1.419	1.419	1.369	1.26
Skelp, grooved steel, P'gh	**1.20**	1.15	1.15	1.15
Skelp, sheared steel, P'gh	**1.25**	1.20	1.20	1.20
Steel hoops, Pittsburgh..	1.30	1.30	1.30	1.25

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

	July 14, 1915.	July 7, 1915.	June 16, 1915.	July 15, 1914.
Sheets, Nails and Wire, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh.	1.75	1.75	1.75	1.80
Galv. sheets, No. 28, P'gh	4.50	4.50	5.00	2.75
Wire nails, Pittsburgh..	1.60	1.60	1.55	1.50
Cut nails, Pittsburgh....	1.55	1.55	1.55	1.55
Fence wire, base, P'gh...	1.40	1.40	1.35	1.30
Barb wire, galv., P'gh...	2.50	2.50	2.40	1.90
Metals, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York.	*22.00*	22.50	22.50	13.87½
Electrolytic copper, N. Y.	*19.50*	19.75	20.37½	13.62½
Spelter, St. Louis.....	**21.75**	21.50	21.50	4.85
Spelter, New York.....	22.00	22.00	22.00	5.00
Lead, St. Louis.....	*5.50*	5.62½	7.00	3.75
Lead, New York.....	*5.65*	5.75	7.00	3.90
Tin, New York.....	*38.12½*	39.25	42.25	31.50
Antimony, Asiatic, N. Y.	*36.00*	36.75	37.50	5.40
Tin plate, 100-lb. box, P'gh	$3.10	$3.10	$3.10	$3.30
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt....	*$1.60*	$1.75	$1.60	$1.75
Furnace coke, future....	1.75	1.75	1.75	1.90
Foundry coke, prompt...	2.00	2.00	2.00	2.25
Foundry coke, future....	2.25	2.25	2.25	2.35
Old Material, Per Gross Ton:				
Iron rails, Chicago.....	12.25	12.25	12.25	12.25
Iron rails, Philadelphia..	15.00	15.00	15.00	15.00
Carwheels, Chicago	11.00	11.00	10.25	11.25
Carwheels, Philadelphia..	**12.50**	12.00	11.50	11.00
Heavy steel scrap, P'gh..	11.75	11.75	11.75	11.50
Heavy steel scrap, Phila.	**12.00**	11.50	11.00	10.25
Heavy steel scrap, Ch'go.	10.25	10.25	9.25	9.75
No. 1 cast, Pittsburgh...	12.25	12.25	12.25	11.50
No. 1 cast, Philadelphia.	12.25	12.25	12.25	12.00
No. 1 cast, Ch'go (net ton)	9.25	9.25	9.00	9.75

Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes. The foregoing rates to the Pacific coast are by rail. The rate via New York and the Panama Canal has no stability, being dependent on vessel charges.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.20c. base net cash, 30 days. Following are stipulations prescribed by manufacturers, with extras:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated Feb. 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gage or weight to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras	Cents per lb.
Gages under ¼ in. to and including 3-16 in.	.10
Gages under 3-16 in. to and including No. 8	.15
Gages under No. 8 to and including No. 9	.25
Gages under No. 9 to and including No. 10	.30
Gages under No. 10 to and including No. 12	.40
Sketches (including straight taper plates), 3 ft. and over	.10
Complete circles, 3 ft. in diameter and over	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive	.05
Widths over 110 in. up to 115 in., inclusive	.10
Widths over 115 in. up to 120 in., inclusive	.15
Widths over 120 in. up to 125 in., inclusive	.25
Widths over 125 in. up to 130 in., inclusive	.50
Widths over 130 in.	1.00
Cutting to lengths under 3 ft. to 2 ft., inclusive.	.25
Cutting to lengths under 2 ft. to 1 ft., inclusive.	.50
Cutting to lengths under 1 ft.	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Wire Products.—Prices to jobbers. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent discount in 10 days, carload lots, annealed, $1.40; galvanized, $2.20. Galvanized barb wire and staples, $2.50; painted, $1.70. Wire nails, $1.60. Galvanized nails, 1 in. and longer, $1.75 advance over base price; shorter than 1 in., $2.25 advance over base price. Woven wire fencing, 69 per cent off list for carloads; 68 off for 1000-rod lots; 67 off for less than 1000-rod lots.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12&12½	13	14	15	16
Annealed	$1.55	$1.60	$1.65	$1.70	$1.80	$1.90	$2.00	$2.10
Galvanized	2.35	2.40	2.45	2.50	2.60	2.70	3.00	3.10

Wire Rods.—Bessemer, open-hearth and chain rods, $25.50.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees, 3 in. and over, 1.25c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs	.10
Angles, 3 in. on one or both legs less than ¼ in. thick, as per steel bar card, Sept. 1, 1909	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail)	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909	.20 to .80
Deck beams and bulb angles	.30
Handrail tees	.75
Cutting to lengths under 3 ft. to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	1.55

No charge for cutting to lengths 3 ft. and over.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect from June 17, 1915, all full weight:

Butt Weld

Steel: Inches	Black	Galv.	Iron: Inches	Black	Galv.
⅛, ¼ and ⅜	72	40½	⅛ and ¼	64	31
½	76	53½	⅜	64	31
¾ to 3	79	57½	½	68	41
			¾ to 2½	71	46

Lap Weld

2	76	54½	1¼	55	30
2½ to 6	78	56½	1½	66	41
7 to 12	76	54½	2	67	43
13 and 14	62½	..	2½ to 4	69	46
15	60	..	4½ to 6	69	46
			7 to 12	67	46

Reamed and Drifted

1 to 3, butt	77	55½	1 to 1½, butt	69	44
2, lap	74	52½	2, butt	69	44
2½ to 6, lap	76	54½	1¼, lap	53	28
			1½, lap	64	39
			2, lap	65	41
			2½ to 4, lap	67	44

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	67	43½	⅜	61	37
½	72	52½	½	66	45
¾ to 1½	76	56½	¾ to 1½	70	47
2 to 3	77	57½	2 and 2½	71	48

Lap Weld, extra strong, plain ends

2	73	51½	1½	65	42
2½ to 4	75	53½	2	67	43
4½ to 6	74	52½	2½ to 4	69	46
7 to 8	68	46½	4½ to 6	68	45
9 to 12	63	41½	7 to 8	61	40
			9 to 12	56	35

Butt Weld, double extra strong, plain ends

½	62	42½	½	56	34
¾ to 1½	65	45½	¾ to 1½	59	37
2 to 2½	67	47½	2 and 2½	61	39

Lap Weld, double extra strong, plain ends

2	63	43½	2	57	34
2½ to 4	65	45½	2½ to 4	59	39
4½ to 6	64	44½	4½ to 6	58	38
7 to 8	58	36½	7 to 8	51	29

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts on less than carloads, f.o.b. Pittsburgh, freight to destination added, in effect from June 15, 1915, are as follows:

Lap Welded Steel		*Standard Charcoal Iron*	
1¾ and 2 in.	64	1¾ and 2 in.	51
2¼ in.	61	2¼ in.	48
2½ to 2¾ in.	67	2½ and 2¾ in.	55
3 and 3¼ in.	72	3 and 3¼ in.	59
3½ and 4½ in.	73	3½ and 4½ in.	61
5 and 6 in.	66	5 and 6 in.	55
7 to 13 in.	63		

Locomotive and steamship special charcoal grades bring higher prices.

1¾ in., over 18 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Sheets.—Makers' prices for mill shipment on sheets of U. S. Standard gage, in carload and larger lots, on which jobbers charge the usual advance for small lots

from store, are as follows, f.o.b. Pittsburgh, terms 30 days net, or 2 per cent cash discount in 10 days from date of invoice:

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	1.25 to 1.30
Nos. 9 to 10	1.30 to 1.35
Nos. 11 and 12	1.35 to 1.40
Nos. 13 and 14	1.45 to 1.50
Nos. 15 and 16	1.55 to 1.60

Box Annealed Sheets, Cold Rolled

	Cents per lb.
Nos. 10 and 11	1.40 to 1.45
No. 12	1.40 to 1.45
Nos. 13 and 14	1.45 to 1.50
Nos. 15 and 16	1.50 to 1.55
Nos. 17 to 21	1.55 to 1.60
Nos. 22 and 24	1.60 to 1.65
Nos. 25 and 26	1.65 to 1.70
No. 27	1.70 to 1.75
No. 28	1.75 to 1.80
No. 29	1.80 to 1.85
No. 30	1.90 to 1.95

Galvanized Sheets of Black Sheet Gage

	Cents per lb.
Nos. 10 and 11	3.50 to 4.00
No. 12	3.60 to 4.10
Nos. 13 and 14	3.60 to 4.10
Nos. 15 and 16	3.70 to 4.20
Nos. 17 to 21	3.85 to 4.35
Nos. 22 and 24	4.05 to 4.55
Nos. 25 and 26	4.20 to 4.70
No. 27	4.35 to 4.85
No. 28	4.50 to 5.25
No. 29	5.25
No. 30	5.50

Chicago

CHICAGO, ILL., July 12, 1915.

Orders for steel have been coming in at such a rate in the past two weeks as to remove further concern regarding mill operations for the last half. Instructions have been received to put in service the full capacity of the leading interest's steel-making units. With all of its blast furnaces and 37 of the 42 open-hearth furnaces active, the Gary Works are also receiving additional steel from South Chicago, where 7 out of 11 blast furnaces are in operation, and 2 more are ready to be blown in. Of the South Works' open-hearth capacity, 20 of the 26 furnaces are making steel, and 4 more will be put in service before the end of the month. The Joliet Works are running full and the Milwaukee bar mills nearly so. At Indiana Harbor all the steel that can be made is being required for the finishing mills, notwithstanding but 13 of the 18 sheets mills are running. The curtailed competition of Eastern mills in this territory, particularly with respect to shapes, plates and bars, as the result of the influx of business to them from other directions, has enabled local mills to reap the benefit of the heavier buying. Daily specifications are running 50 per cent in excess of shipments, and almost as much in excess of capacity operation. While the heaviest tonnages are traceable to track work, car building and bridges, the marked increase in the number of smaller structural jobs and the decidedly heavier programs projected by the implement interests are sources of marked satisfaction. The American Bridge Company has finally been awarded the 24,000 tons for the bridge at St. Louis, and, of the order for 4100 cars placed with the American Car & Foundry Company for Russia, from 1500 to 1800 will be built in the West. These cars will require about 5 tons of steel per car. The closing of contracts for bolts by the railroads has been an important activity of the week, but despite the strength of bar prices the placing of this business was characterized by marked concessions. Pig-iron buying is not heavy, but several sales of quantities up to 2000 tons are noted. The principal demand has been for malleable iron. In the scrap market, heavy melting steel has been especially strong, with nearly all other grades following in an upward movement of prices.

Pig Iron.—Sales of pig iron involving lots of 2000, 1000 and 500 tons of malleable are characteristic of last week's transactions, which in the aggregate displayed some improvement. Founders are figuring on a much increased volume of business, and reports are increasingly promising with respect to further buying for last half. The Northern market is decidedly well established on the basis of $13, at the furnace, for No. 2 foundry, although the marked activities of one interest are currently reported to have been predicated upon attractive quotations for combination grades of iron. A sale of 500 tons of standard No. 2 Southern iron on the basis of $10, Birmingham, in competitive territory, presents strong evidence of the Southern situation. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. a ton.

Lake Superior charcoal, Nos. 2 to 5	$15.75
Lake Superior charcoal, No. 1	16.25
Lake Superior charcoal, No. 6 and Scotch	16.75
Northern coke foundry No. 1	$13.50 to 13.75
Northern coke foundry, No. 2	13.00 to 13.50
Northern coke foundry, No. 3	12.50 to 13.00
Southern coke, No. 1 f'dry and 1 soft.	14.25 to 14.50
Southern coke, No. 2 f'dry and 2 soft.	13.75 to 14.00
Malleable Bessemer	13.00 to 13.25
Standard Bessemer	16.50
Basic	12.50 to 13.00
Low phosphorus	20.00 to 20.50
Jackson Co. and Ky. silvery, 8 per cent.	16.50 to 17.00
Jackson Co. and Ky. silv'y, 10 per cent.	17.50 to 18.00

Rails and Track Supplies.—Except for 8000 tons of rails to be rolled by the Colorado Fuel & Iron Company for the San Pedro, Los Angeles & Salt Lake Railroad, and an additional order from the New York Central Lines, no new rail tonnages are reported. Of the recent Rock Island order, 18,000 tons has already been specified to local mills. The orders for spikes and bolts continue heavy, and tie plate quotations have been advanced to a minimum of $24 at the mill. We quote standard railroad spikes at 1.50c. to 1.55c., base; track bolts with square nuts, 1.90c. to 2c., base, all in carload lots, Chicago; tie plates, $24 to $25, f.o.b. mill, net ton; standard section Bessemer rails, Chicago, 1.25c., base, open-hearth, 1.34c.; light rails, 25 to 45 lb., 1.07c.; 16 to 20 lb., 1.12c.; 12 lb., 1.17c.; 8 lb., 1.22c.; angle bars, 1.50c., Chicago.

Structural Material.—Following a slight delay, the contract for 24,000 tons for the St. Louis bridge has been definitely awarded to the American Bridge Company. It is expected that this steel will be rolled and fabricated at Chicago. Additional car steel to the amount of about 9000 tons is to be placed here for the 1500 to 1800 cars which the American Car & Foundry Company will build at its western shops for Russia. The Great Northern has been figuring on 500 cars and instructions have been issued for the immediate purchase of 2000 by the Baltimore & Ohio. While the bulk of recent orders for shapes has to do with the building of cars and bridges, an even more significant indication of improvement in the situation is the large number of small jobs now being figured by the fabricators. The Decatur Bridge Company has just taken a 500-ton job following contracts for 400 tons for buildings at Champaign, Ill.; another bridge shop reports quotations out on 800 tons, distributed among several jobs; A. Wendnagel & Sons, Chicago, have taken contracts for the fabrication of steel for the Eugene Field high school, Chicago, and a lodge building at Danville, Ill., involving a total of 500 tons, while four other contracts placed last week with the American Bridge Company and the Gage Structural Steel Company, aggregate about 550 tons. Prices of fabricated steel are still far from satisfactory, but the pending settlement of the building trade strike at Chicago is expected to be an effective influence toward a betterment of this situation. We quote for Chicago delivery of shapes from mill 1.439c.

We quote for Chicago delivery of structural steel out of stock 1.75c.

Plates.—The market level for plates for forward delivery has advanced to the basis of 1.20c., Pittsburgh, though for immediate shipment 1.15c. can still be done. The extremities of the mills with respect to plate tonnage have been largely relieved, and the solicitation of business reflects a greater assurance in the mills' position. We quote for Chicago delivery of plates from mill 1.339c. to 1.389c.

We quote for Chicago delivery of plates out of stock 1.75c.

Sheets.—The effort being made by sheet makers to encourage the use of painted black sheets of heavier gage as a substitute for galvanized sheets is having its influence, and mill operations are somewhat im-

proved as a result. The Inland Steel Company now has operating 13 of its 18 mills. With respect to galvanized sheets no essential change is apparent. We quote for Chicago delivery from mill No. 10 blue annealed, 1.489c.; No. 28 black, 1.939c.; No. 28 galvanized, 5.15c. to 5.439c.

We quote for Chicago delivery from jobbers' stocks as follows, minimum prices applying on bundles of 25 or more: No. 10 blue annealed, 1.95c.; No. 28 black, 2.55c.; No. 28 galvanized, 4.85c.

Bars.—The programs of a number of the agricultural implement interests contemplate a beginning of fall manufacturing schedules July 19, and specifications from them are now being received on a liberal scale. Instances of urgency are not lacking, and the tone of affairs related to the implement industry is distinctly more vibrant. Demand for hard steel is less responsive. Bar iron tonnage is conspicuously light, contrasted with the improvement in other directions, and the mills are barely on a 50 per cent schedule. We quote for mill shipment as follows: Bar iron, 1.20c.; soft steel bars, 1.439c.; hard steel bars, 1.20c.; shafting, in carloads, 65 to 68 per cent off; less than carloads, 60 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 1.65c.; bar iron, 1.65c.; reinforcing bars, 1.65c., base, with 5c. extra for twisting in sizes ½ in. and over and usual card extras for smaller sizes; shafting 60 per cent off, and in carloads, 62 per cent off.

Wire Products.—Upon no other product has the strengthening influence of export shipments been more noticeable than upon wire, and the market for these products is strong very largely for this reason. The past week, however, brought heavier specifications from domestic sources, particularly for wire nails. We quote per 100 lb.: Wire nails, $1.789; painted barb wire, $1.889; galvanized barb wire, $2.689; polished staples, $1.889; galvanized staples, $2.689.

Old Material.—The demand for melting steel to fill mill orders is felt on every hand and the strength of the market is focused in this grade of material. While for the time being the crest of the upward movement appears to have been reached, scrap values generally are decidedly firm at higher levels. The demand for borings is prominent, but mill grades continue inactive. Turnings show some signs of weakness. Railroad offerings are light, totalling about 8000 tons, of which the St. Paul offers 1350 tons, the Northern Pacific 1500 tons and about 1100 carwheels, the Michigan Central 2200 tons, the Northern Pacific 1800 tons, the Soo Line, Monon Chicago & Alton and the Belt Railway of Chicago from 300 to 500 tons each. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton

Old iron rails	$12.25 to $12.50
Old steel rails, rerolling	10.25 to 10.75
Old steel rails, less than 3 ft	10.25 to 10.75
Relaying rails	19.50 to 20.50
Old carwheels	11.00 to 11.25
Heavy melting steel scrap	10.25 to 10.50
Frogs, switches and guards, cut apart	10.25 to 10.50
Shoveling steel	9.75 to 10.00
Steel axle turnings	7.25 to 7.50

Per Net Ton

Iron angles and splice bars	$12.00 to $12.50
Iron arch bars and transoms	12.25 to 12.75
Steel angle bars	9.25 to 9.50
Iron car axles	13.75 to 14.00
Steel car axles	10.00 to 10.50
No. 1 railroad wrought	9.00 to 9.50
No. 2 railroad wrought	8.75 to 9.00
Cut forge	8.75 to 9.00
Steel knuckles and couplers	9.25 to 9.50
Steel springs	9.50 to 9.75
Locomotive tires, smooth	9.00 to 9.25
Machine shop turnings	5.00 to 5.50
Cast borings	5.25 to 5.75
No. 1 busheling	7.25 to 7.75
No. 2 busheling	6.25 to 6.75
No. 1 boilers, cut to sheets and rings	5.50 to 6.00
Boiler punchings	8.25 to 8.50
No. 1 cast scrap	9.25 to 9.75
Stove plate and light cast scrap	8.25 to 8.50
Grate bars	7.75 to 8.25
Railroad malleable	8.75 to 9.25
Agricultural malleable	8.25 to 8.50
Pipes and flues	6.75 to 7.00

Rivets and Bolts.—The closing of contracts with the railroads covering annual requirements of bolts has been one of the interesting features of the week. Concessions made by some of the bolt makers who took a large part of this business have been surprising in view of the strength shown in bars. Prices from 5 to 7½ per cent below our quotations were the basis of a number of very large contracts, and it is understood that the trade generally found it necessary to meet the aggressive campaign of the few. Quotations are as follows: Carriage bolts up to ⅝ x 6 in., rolled thread, 80-10; cut thread, 80-5; larger sizes, 75-15; machine bolts up to ⅝ x 4 in., rolled thread, with hot pressed square nuts, 80-15; cut thread, 80-10; larger sizes, 80; gimlet point coach screws, 85; hot pressed nuts, square, $6.40 off per cwt.; hexagon, $7.30 off per cwt. Structural rivets, ¾ to 1¼ in., 1.65c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 2c.; boiler rivets, 2.10c.; machine bolts up to ⅝ x 4 in., 75-15; larger sizes, 70-10-10; carriage bolts up to ⅝ x 6 in., 75-10; larger sizes, 70-15 off; hot pressed nuts, square, $6, and hexagon, $6.70 off per cwt

Cast-Iron Pipe.—Little business came to light last week and the only letting of importance, that for 2300 tons at Covington, Ky., has been postponed. We quote as follows, per net ton, Chicago: Water pipe, 4 in., $26; 6 to 12 in., $24; 16 in. and up, $23.50, with $1 extra for Class A water pipe and gas pipe.

Philadelphia

PHILADELPHIA, PA., July 13, 1915.

The demand for steel is such that the activity of the mills is sustained in all cases, while in some it is materially increased, the latter being especially true of those which have not heretofore fully shared in the betterment. A good part of the demand is special in character and is traceable to war orders. There is a growing request for bars and rounds needed in the manufacture of shrapnel and high explosive shells. The situation is really anomalous, for some industrial lines which ordinarily contribute a great deal to steel mill activity are not yet awakened. It must be admitted, however, that their operations are assuming a better scale with the spreading out of the war demand. The Alan Wood Iron & Steel Company put an additional furnace in blast at Swedeland, Pa., July 12. Structural shapes are quiet in this territory. Bars are strong, particularly those adapted to shell work. The movement in plates is maintained, and mills heretofore not busy are getting more of the orders. Sheet prices are stronger. Billets are active. In pig iron there is a slight betterment, which is especially welcome to the foundry iron trade. Better prices are being obtained. Low phosphorus iron is moving steadily at full prices. Old materials are the subject of improved inquiry, and prices are stronger. Coke has advanced, and the higher quotation has been paid for contract furnace. The ferromanganese situation seems but little changed.

Iron Ore.—Arrivals in the week ended July 10 consisted of 9600 tons from Cuba and 6975 tons from Sweden.

Pig Iron.—The market is only a little improved so far as sales go, but inquiry is better and a more cheerful feeling exists throughout the trade. A good movement is looked for in August. Quotations are firmer and instances are mentioned where higher prices have been paid. A local malleable casting foundry has bought 1500 tons of eastern Pennsylvania iron, including 900 tons of malleable, 400 tons of special basic, and 200 tons of foundry, all for July and August delivery. A New England interest has taken 800 tons of No. 2 on a basis of $15.25, delivered. Inquiries now being figured on call for one lot of 1300 tons and another of 2000 tons of foundry iron and 6000 tons of basic. Virginia irons have moved a trifle better. The only sale of basic reported is one of 500 tons, delivery at the rate of 50 tons a day, indicating pressing need. The inquiry of an eastern Pennsylvania mill for 3000 tons of low phosphorus is understood to be still pending. Various buyers have taken about 1000 tons of standard low phosphorus in the week, some of which sold on the basis of $21.60, delivered. Lebanon low phosphorus is moving at a steady though not exceptional pace. The bulk of business in all grades is in

small lots. Orders recently booked by pipe works forecast buying on their part at an early day. Furnace stocks in Virginia increased a little less than 10,000 tons in June, while orders decreased about 5000 tons. Eastern Pennsylvania furnace stocks went down slightly, while orders increased about 23,000 tons. The market for foundry iron is a little stronger. Quotations for standard brands for early delivery in buyers' yards in this district are as follows:

Eastern Penna. No. 2 X, foundry	$14.25 to $14.75
Eastern Penna. No. 2 plain	14.00 to 14.50
Virginia, No. 2 X, foundry	15.25 to 15.75
Virginia, No. 2 plain	15.00 to 15.25
Gray forge	13.25 to 13.50
Basic	14.00
Standard low phosphorus	21.50

Ferroalloys.—Local representatives of English producers still quote $100, seaboard, for 80 per cent ferromanganese. Two steamships are now unloading here, both of which have consignments for agents of English makers, and there is one arrival at Baltimore. The total is not stated, but one firm will receive 400 tons. Domestic ferromanganese is still available in limited quantities, and negotiations for the purchase of manganese ore indicate a continuance of this source of supply, which, as stated heretofore, will not go far should a heavy demand develop. The quotation for 50 per cent ferrosilicon is unchanged at $71 to $73, Pittsburgh.

Bars.—The demand for steel bars has lessened a little locally, but quotations are strong at 1.409c., Philadelphia, for delivery this quarter. Inquiry for steel rounds for shrapnel and explosive shells is assuming large proportions. In the past few days one mill has taken orders for 10,600 tons, made up of lots of 4000, 1600, and 5000 tons, and options on further lots have been given. One inquiry issued by a New England syndicate, said to have an order from Great Britain, is for over 100,000 tons. Quotations have advanced and 2c. to 2.50c. is now asked. A good part of the material wanted is 4 and 5 in. in diameter. A leading maker of iron bars continues to ask 1.25c., mill, or 1.324c., delivered, but this price is not the minimum.

Plates.—Business from shipyards is still appearing and this, together with miscellaneous orders for tank and boiler work, keeps representative mills filled up three or four weeks ahead. In the case of a few small lots urgently needed bonuses have been offered. On miscellaneous lots for delivery this quarter 1.409c., Philadelphia, is obtained, but an attractive order would go at 1.359c., equal to 1.20c., Pittsburgh. There is more inquiry for universal plates, but this branch of the business still lags. Further inquiry is out for boats, two tankers being mentioned specifically.

Structural Material.—Locally there is nothing of interest in the way of new propositions. On miscellaneous inquiries 1.409c., Philadelphia, is quoted on deliveries this quarter, and 1.359c., on a desirable job. Contracts are still effective against which specifications are made at 1.259c. and 1.309c., Philadelphia.

Sheets.—The market is becoming lively, and there are indications that western mills are becoming filled up. Prices are stronger, but vary to an extent which makes it difficult to determine the exact level, if there is one. Quotations range from 1.509c. to 1.559c. Philadelphia.

Billets.—There is a good demand for both open-hearth rolling billets and for forging billets. The latter are being called for as a result of the locomotive orders placed in recent weeks. Rolling billets are quoted at $24.56 to $25.06, Philadelphia. Forging steel commands $4 to $5 more.

Coke.—Foundry coke is gaining strength in reflection of the improved situation and outlook in the pig-iron market. Furnace coke is firm at the recent advance which made the quotation for spot $1.75 per net ton at oven, and for contract, $1.85. At the latter figure an eastern Pennsylvania mill has contracted to supply a furnace which has just been blown in. Both prompt and contract foundry are quoted at $2 to $2.50 per net ton at oven. Freight rates from the principal producing districts are as follows: Connellsville, $2.05; Latrobe, $1.85, and Mountain, $1.65.

Old Material.—The mills have not taken hold to an extent which makes for a big volume of sales, but the market is more active and dealers are advancing their quotations. The railroad list went at high prices to both dealers and consumers. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates from 35c. to $1.35 per gross ton, are as follows:

No. 1 heavy melting steel	$12.00 to $12.50
Old steel rails, rerolling	12.00 to 12.50
Low phos. heavy melting steel scrap	15.00 to 15.50
Old steel axles	14.25 to 14.75
Old iron axles	17.50 to 18.00
Old iron rails	15.00 to 15.50
Old carwheels	12.50 to 13.00
No. 1 railroad wrought	13.00 to 13.25
Wrought-iron pipe	10.75 to 11.25
No. 1 forge fire	9.00 to 9.50
Bundled sheets	9.00 to 9.50
No. 2 busheling	7.75 to 8.25
Machine shop turnings	8.50 to 9.00
Cast borings	8.50 to 9.00
No. 1 cast	12.25 to 12.75
Grate bars, railroad	9.50 to 9.75
Stove plate	9.50 to 9.75
Railroad malleable	10.00 to 10.50

Cleveland

CLEVELAND, OHIO, July 13, 1915.

Iron Ore.—Conditions appear brighter than they have at any time since the opening of the season. Some additional sales are being made and a number of consumers are in the market for their requirements. Among these are some that, early in the season, purchased only enough to last them until September. Most consumers having long time contracts are ordering the maximum tonnages stipulated in these contracts. Several sales in lots of 5000 to 6000 tons have recently been made to Eastern consumers to supply immediate requirements, due to failure of shipments of foreign ore to arrive according to schedule. Other sales of ore in the East have also been made in small lots. Some of the leading ore firms have already sold more ore than they did during the entire season last year. The improved conditions in the ore trade, due to the present satisfactory condition in the steel industry, lead sellers to revise their early estimate of the season's shipments. Late estimates are that the ore movement for the season will exceed 42,000,000 tons. We quote prices as follows, delivered to lower lake ports: Old Range Bessemer, $3.75; Mesaba Bessemer, $3.45; Old Range non-Bessemer, $3; Mesaba non-Bessemer, $2.80.

Pig Iron.—Sentiment has improved materially and there is a better volume of inquiry than for some time. A round lot sale of basic iron is reported by a Valley furnace at $13, which now appears to be the general asking price. Several basic inquiries are pending. One Valley furnace has advanced its price on foundry iron to $13 for No. 2 and $12.75 appears to represent the bottom of the market in the Valley, although this grade can still be had at $12.50 in Cleveland for outside shipment. Local furnaces report a few sales in lots of 500 tons and under; among new inquiries is one from Massillon for 300 tons of No. 1 and 700 tons of No. 2 foundry for the last half. Consumers continue to sound the market on iron for the first half of next year, but furnaces are refusing to quote that far ahead. Southern iron is quiet with prices unchanged at $9.50 to $10, the lower price being for delivery not beyond the third quarter. We quote, delivered Cleveland, as follows:

Bessemer	$14.65
Basic	$13.65 to 13.90
Northern No. 2 foundry	13.00
Southern No. 2 foundry	13.50 to 14.00
Gray forge	12.75
Jackson Co. silvery 8 per cent silicon	16.37 to 16.62
Standard low phosphorus at furnace	19.75 to 20.00

Coke.—The market is quiet but firm, and some producers have advanced prices on foundry grades about 10c. a ton. One of the best known makes has been advanced to $2.60 for contracts. We quote best grades of 72-hr. foundry coke at $2.25 to $2.50 per net ton at oven for prompt shipment, and $2.25 to $2.50 for contract. Most consumers are now covered by contracts. Furnace coke is quoted at $1.70 to $1.75 for prompt shipment and contract.

Finished Iron and Steel.—Conditions are very satisfactory. While the volume of orders shows a falling off that was expected as compared with the last week or two in June, there is a good volume of specifications on higher priced third quarter contracts, and some inquiries from consumers who previously covered for only a portion of their requirements for the remainder of the year. The demand for bars is heavy and mills are getting further behind on deliveries. Plates can still be had at 1.15c., Pittsburgh, from the smaller mills, but steel bars and structural material are firm at 1.25c. for the third quarter. There is a good demand for forging billets and local sales are being made on the basis of $26.50, Pittsburgh, for prompt shipment and $27.50 for the last half. Open-hearth rerolling billets have sold as high as $22, Youngstown, for 200 tons for prompt shipment. Little new inquiry is coming out for structural material for building purposes. However, local fabricators are figuring on the Department of Interior Building, Washington, that will require 6125 tons, bids for which are now being taken. The demand for black and blue annealed sheets continues good and prices are firm. Quotations on galvanized sheets are irregular, ranging from 4.50c. to 6c. We quote No. 28 black sheets at 1.75c. to 1.80c., Ohio mill, and No. 10 blue annealed at 1.35c. Iron bars are inactive at 1.15c., Pittsburgh. Warehouse business is good at 1.80c. for steel bars and 1.90c. for plates and structural material.

Bolts, Nuts and Rivets.—The demand for bolts and nuts has improved and some of the local makers are now operating their plants at full capacity. Most of the large consumers, including the leading railroads, are now under contract for the last half and specifications are coming out freely. Prices are being well maintained. Rivet specifications have improved. We quote rivets at 1.50c., Pittsburgh, for structural and 1.60c. for boiler. Bolt and nut discounts are as follows: Common carriage bolts, ⅜ x 6 in., smaller or shorter, rolled thread, 75, 10 and 10 per cent; cut thread, 75, 10 and 10 per cent; larger or longer, 75 and 10 per cent; machine bolts with h.p. nuts, ⅜ x 4 in., smaller or shorter, rolled thread, 75, 10, 10 and 10 per cent; cut thread, 75, 10, 10 and 5 per cent; larger or longer 75 and 15 per cent; coach and lag screws, 80 and 20 per cent; square h.p. nuts, blank or tapped, $6.30 off; hexagon h.p. nuts, blank or tapped, $7.10 off; c.p.c. and t-square nuts, blank or tapped, $5.80 off; hexagon, ⅝ in. and larger, $7.25 off; 9/16 and smaller, $8 off; semi-finished hexagon nuts, ⅝ in. and larger, 85, 10 and 10 per cent; 9/16 and smaller, 85, 10, 10 and 10 per cent.

Old Material.—The market is very dull with a tendency toward weakness. Mills are not buying and there is little trading between dealers. Several consumers are holding back on shipments. There is a large amount of scrap on the market, particularly borings and turnings, which dealers are having great difficulty in disposing of. Prices are unchanged. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton

Old steel rails, rerolling	$11.00 to $11.75
Old iron rails	12.00
Steel car axles	12.25 to 12.75
Heavy melting steel	10.50 to 11.00
Old carwheels	9.75 to 10.00
Relaying rails, 50 lb. and over	22.50
Agricultural malleable	8.50
Railroad malleable	10.25 to 10.50
Steel axle turnings	8.75 to 9.00
Light bundled sheet scrap	8.00 to 8.50

Per Net Ton

Iron car axles	$14.00 to $14.50
Cast borings	6.00 to 6.25
Iron and steel turnings and drillings	5.50 to 5.75
No. 1 busheling	8.50 to 8.75
No. 1 railroad wrought	9.25 to 9.50
No. 1 cast	9.75 to 10.25
Stove plate	8.00 to 8.25

The Canadian Car & Foundry Company has received an order from the railroad executive committee of the British war office for 1200 four-wheeled Continental type, 22-ton steel frame box cars. The cars are to be used in connection with military operations of the British army in northern France.

Cincinnati

CINCINNATI, OHIO, July 14, 1915—(*By Wire*).

Pig Iron.—The market is dragging as far as new business is concerned, but specifications on old contracts are very satisfactory. Few requests to hold up shipments are now being received; in some instances melters are taking more iron than is due them. The stove foundries are exceptions, although this is generally their dull season. Quite a number of new inquiries are out for foundry iron to be shipped in the first quarter and the first half of next year. Neither the Southern nor the Northern furnaces are willing to name prices for such an advanced delivery, but it is understood that a few iron merchants have quoted on a basis of $1 a ton above present prices. Business is principally confined to small fill-in orders and mostly for nearby shipment. The majority of Southern producers are asking $10, Birmingham basis, for No. 2 foundry, but $9.50 can be done on at least two standard brands. It is rumored that a basic inquiry is pending in this territory, but so far it has not come to light. Based on freight rates of $2.90 from Birmingham and $1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft	$12.90 to $13.40
Southern coke, No. 2 f'dry and 2 soft	12.40 to 12.90
Southern coke, No. 3 foundry	11.90 to 12.40
Southern No. 4 foundry	11.40 to 11.90
Southern gray forge	10.90 to 11.40
Ohio silvery, 8 per cent silicon	16.01 to 16.26
Southern Ohio coke, No. 1	14.76 to 15.26
Southern Ohio coke, No. 2	13.76 to 14.26
Southern Ohio coke, No. 3	13.51 to 13.76
Southern Ohio malleable Bessemer	13.76 to 14.01
Basic, Northern	13.76 to 14.01
Lake Superior charcoal	16.20 to 17.20
Standard Southern carwheel	26.90 to 27.40

(*By Mail*)

Finished Material.—Business is rather quiet in most all lines. There is not much business coming in for galvanized sheets and no manufacturer is willing to contract ahead at the present quotation of 5c., Pittsburgh basis, for No. 28 gage. Black sheets are quoted around 1.75c. to 1.80c., Pittsburgh, and buyers now seem to be more willing to cover for future requirements, as sheet metal contractors are substituting heavier gages of black sheets in place of the galvanized product in many instances. Warehouse quotations on No. 28 galvanized sheets run all the way from 4.50c. to 5c., Cincinnati, but it is understood that only a comparatively small tonnage is for sale. Warehouse prices on steel bars are unchanged at 1.80c. The demand for hoops and bands has been larger than was anticipated and the mills are generally behind in their deliveries.

Old Material.—The market has stiffened considerably and a general advance of about 25c. a ton is quoted on nearly all grades. Contracting for future supplies has been quite liberal, both on the part of the foundries and rolling mills. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices, f.o.b. at yards.

Per Gross Ton

Bundled sheet scrap	$6.50 to $7.00
Old iron rails	10.75 to 11.75
Relaying rails, 50 lbs. and up	19.50 to 20.00
Rerolling steel rails	8.75 to 9.25
Heavy melting steel scrap	8.75 to 9.25

Per Net Ton

No. 1 railroad wrought	$8.75 to $9.25
Cast borings	4.75 to 5.25
Steel turnings	4.75 to 5.25
Railroad cast scrap	9.25 to 9.75
No. 1 machinery cast scrap	10.50 to 11.00
Burnt scrap	6.75 to 7.25
Old iron axles	13.75 to 14.25
Locomotive tires (smooth inside)	8.75 to 9.25
Pipes and flues	6.00 to 6.50
Malleable and steel scrap	7.25 to 7.75
Railroad tank and sheet scrap	5.25 to 5.75

Coke.—Very little business is being transacted and no large contracts for either furnace or foundry grades are expected in the early future. A few foundries have sufficient coke due on old contracts to run them close to the end of the year, but these consumers are expected to come into the market before long for the first half of 1916. Quotations are firmer and Connellsville and

Virginia 72-hr. cokes are held strong at $2.25 per net ton at oven for prompt shipment and around $2.40 to $2.50 for contract business. The Louisville & Nashville bought approximately 3000 tons of foundry coke for shipment to its foundry at Louisville, Ky.

Buffalo

BUFFALO, N. Y., July 13, 1915.

Pig Iron.—Heavy sales of malleable are reported for the week with a considerable aggregate of small orders for foundry grades. Several thousand tons of malleable were quoted on, exclusive of the 10,000 tons for which the Eastern Malleables Company recently came into the market. About 1000 tons of the latter has already been taken by a Buffalo furnace at a figure approximating $12.50, furnace, which is now the minimum of the market for anything but off-grade iron. Most of the producers are beginning to re-establish grade differentials more definitely and are now asking better than $13 on high silicon iron, while accepting as low as $12.50 for No. 2 plain. Some sellers decline to accept $13 for No. 1 foundry and Scotch iron, quoting $13.25 to $13.50. Conditions are apparently working toward an advance in prices. We quote for last half delivery, f.o.b. furnace, Buffalo, as follows:

No. 1 foundry	$13.00 to $13.50
No. 2 X foundry	12.75 to 13.00
No. 2 plain	12.50 to 12.75
No. 3 foundry	12.50 to 12.75
Gray forge	12.50
Malleable	12.50 to 13.00
Basic	13.00 to 13.50
Charcoal, regular grades and analysis	15.75 to 17.25
Charcoal, special grades and analysis	19.00 to 20.00

Old Material.—The market continues quite active at firm prices, with heavy shipments being made on orders, the movement in heavy melting steel predominating. Several sales in borings and turnings have been made during the past week at a slight concession in price, but not sufficiently lower to quotably effect the schedule. There is a strong feeling in the trade that the long-talked-of advance in prices will materialize in the very near future, owing to the increased consumption and the diminishing of yard stocks which has been going on for some time. Old carwheels, railroad and machinery cast scrap and railroad malleable are not so active as the remainder of the list. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel	$10.75 to $11.00
Low phosphorus steel	13.00 to 13.50
No. 1 railroad wrought scrap	10.50 to 11.00
No. 1 railroad and machinery cast	11.00 to 11.50
Old steel axles	12.00 to 12.50
Old iron axles	16.00 to 16.50
Old carwheels	11.50 to 12.00
Railroad malleable	10.50 to 11.00
Machine shop turnings	5.75 to 6.25
Heavy axle turnings	8.50 to 9.00
Clean cast borings	6.75 to 7.00
Old iron rails	11.00 to 11.50
Locomotive grate bars	9.00 to 9.50
Stove plate (net ton)	8.25 to 8.75
Wrought pipe	7.00 to 7.50
Bundled sheet scrap	7.25 to 7.75
No. 1 busheling scrap	8.50 to 9.00
No. 2 busheling scrap	6.50 to 7.00
Bundled tin scrap	9.00

Finished Iron and Steel.—While specifications against third quarter contracts have been rather light for the week, the accumulation of business which developed during the latter part of the second quarter was so large that practically all of the mills represented in this territory report their operating departments are being pushed to the limit and deliveries on practically all commodities are falling behind, bar material being two to three weeks in arrears on small sizes and three to four weeks on large sizes, with structural material and plates the same length of time behind. The pressure for export products and development of new inquiries for bars and cold finished steel to be used in connection with war supplies are very heavy, and some inquiries are being turned down, owing to the inability of mills to entertain further commitments at this time. Prices are firmly held, and the leading interest announces an advance on bars, plates and shapes to 1.30c. for current business to go into effect July 15. Tin-plate orders for export are coming in in extraordinary volume. Building operations are becoming more active, and the demand for structural material is good. The Buffalo Structural Steel Company has the contract for fabricating and erecting 1400 tons of steel for extensive addition to the plant of the Buffalo Copper and Brass Rolling Mill Company, the Lackawanna Steel Company to furnish the steel. The Ferguson Iron and Steel Company has orders for 100 tons of steel for the Delaware-Bryant Apartment Building, this city.

Birmingham

BIRMINGHAM, ALA., July 12, 1915.

Pig Iron.—The distinguishing feature of the Southern iron market is the maintenance and in some cases the hardening of prices despite the infrequency of transactions. One company which sold over twice its production in June has sold its output thus far in July. All other producers report scattering sales of small lots on the basis of $10. The price of spot is generally $9.75. In the week there was an inquiry from a consumer for 30,000 to 40,000 tons for last half and first quarter delivery. Inquiries for smaller lots for 1916 were also received. No quotations for 1916 were made so far as can be learned. Among the week's sales were a lot of 500 tons of No. 1 foundry at $10.50, one of 500 tons of No. 2 foundry for Western delivery during the rest of the year at $10, and one of 500 tons of high sulphur on the basis of $9.50. The last-mentioned was off-iron and an exceptional transaction. The general situation shows a continued absence of inquiry but heavy shipments. Alabama stocks of free foundry iron are below 200,000 tons. One Alice furnace and one Ensley stack of the Tennessee Company were blown in in the week, one on chill-cast foundry, the other on basic iron. It is now definitely settled that the Vanderbilt stack of the Woodward Iron Company will not go in until September, by which time the additions to the Woodward Company's by-product coke plant at Woodward will be ready to furnish coke. That company has begun the construction of a 3000-gal. benzol plant of its own adjacent to the 2000-gal. plant of the Edison company, already in operation. Both will draw raw material from the Woodward by-product works. The Gulf States Steel Company is working its mills at Alabama to capacity, the business being both for domestic and export consumption. The Ensley rail mill is operating to greater capacity this month and the American Steel & Wire Company's wire fencing mill goes on double turn this week to execute orders reported as coming from abroad. The stove factories are operating under 50 per cent or not at all. The jobbing foundry trade has improved slightly, but is not good. We quote per gross ton for spot and last half delivery, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	$10.25 to $10.50
No. 2 foundry and soft	9.75 to 10.00
No. 3 foundry	9.25 to 9.50
No. 4 foundry	9.00 to 9.25
Gray forge	8.75 to 9.00
Basic	9.75 to 10.00
Charcoal	21.00 to 21.25

Cast-Iron Pipe.—Pipe makers have advanced quotations 50c. per ton with a tendency to ask still more for some sizes. The volume of orders, while not consisting of large lots, is satisfactory. The output is about 75 per cent and the pipe is moving out as manufactured. The situation with the water-pipe producers is altogether superior. The sanitary pipe shops report an improved market. We quote, per net ton, f.o.b. pipe shop yards, as follows: 4-in., $20.50; 6-in. and upward, $18.50, with gas pipe $1 additional.

Coal and Coke.—The coke market is irregular, but the 25 to 40 per cent of the beehive ovens, which have been active during the past ten months, keep going with a demand for the supply. The by-product plants are busier, and the inroads of by-product coke are being felt. One large pipe maker is now using by-product coke. There have been recent shipments of coke to Argentina in small lots. We quote, per net ton, f.o.b. ovens, as follows: Beehive furnace coke, $2.50 to

$2.75; beehive foundry, $3 to $3.25; by-product, $2.25 to $2.50, with some grades selling higher. It is officially reported that the first cargo (1000 tons) of coal from the Maxine mines of the Pratt Consolidated Company, towed down the river to Mobile, was delivered there at 50c. per ton under the rail rate, which is $1.10. The returning tow-boat brought merchandise from New York via steamer to Mobile for a Birmingham firm at a saving of 20c. per 100 lb. Delivery from the river near Maxine, 20 miles from Birmingham, was by motor truck. Alabama coal operators during the week presented their plea to the Interstate Commerce Commission, sitting in Birmingham, for an adjustment of freight rates from Alabama mines to points in the Mississippi Valley and of those applying to Illinois and Kentucky mines. It is not sought to lower the Alabama rate, but rather to raise the Illinois and Kentucky rate. Such an adjustment is asked for will tend to increase Alabama business to Memphis, Louisiana and at intermediate points. The Yolande coal mine has completed its installation of initial hydroelectrical equipment. Operators are convinced that the last half year's output will exceed that of the first half.

Old Material.—The old material market is flat. Dealers report the movement of only scattering lots and quotations as nominal. We quote, per gross ton, f.o.b. dealers' yards, as follows:

Old iron axles	$13.00 to $13.50
Old steel axles	12.50 to 13.00
Old iron rails	12.50 to 13.00
No. 1 railroad wrought	8.50 to 9.00
No. 2 railroad wrought	7.50 to 8.00
No. 1 country wrought	8.00 to 8.50
No. 1 machinery cast	8.25 to 8.50
No. 1 steel scrap	8.00 to 8.25
Tram carwheels	8.25 to 8.50
Stove plate	7.00 to 7.50

St. Louis

ST. LOUIS, MO., July 12, 1915.

Pig Iron.—An improvement in the demand has been noted though inquiry has been more tentative than specific. The chief sale of the week was of 1000 tons of malleable for delivery over the last half. The remainder of the transactions were for lots of 100 tons and ranged from that down to carloads.

Coke.—The business of the week was in small lots aside from a few delayed renewals of annual contracts which were on the basis of last year's specifications. By-product coke continues to be quoted competitively and there is therefore some instability in the market. Connellsville coke has been marked up 10c. per ton for all deliveries and grades as a result of the shortage of labor at the ovens.

Finished Iron and Steel.—The general run of orders in the past week has been better. The award of the Municipal Free Bridge contract for 24,000 tons was formally made to the American Bridge Company Friday. Fabricators report the demand for structural material improving and that there is an increase in the business in prospect. An improvement is reported in light rails, which are being more freely taken, and track fastenings are in good demand. The demand from the agricultural and vehicle interests is stronger with an improvement in plates. Bars are in good request, particularly for reinforcing. Deliveries are generally becoming more extended and prices more firmly held than ever. Movement out of warehouse has been increased by the extension of contract deliveries and prices are firm. We quote for stock out of warehouse as follows: Soft steel bars, 1.70c.; iron bars, 1.70c.; structural material, 1.80c.; tank plates, 1.80c.; No. 10 blue annealed sheets, 2c.; No. 28 black sheets, cold rolled, one pass 2.55c.; No. 28 galvanized sheets, black sheet gage, 4.85c.

Old Material.—Considerable improvement is noted as well as a growing demand from the rolling mill interests for steel mill and foundry grades of old material. In consequence prices have improved and dealers are becoming more active. The market is generally much stronger. Lists out during the week include 3000 tons from the Southern, 1000 tons from the Chicago & Alton, 2000 tons from the Missouri Pacific and 2000 tons from the Union Pacific. These have not had the effect of depressing prices as has been the case recently. We quote dealers' prices f.o.b. St. Louis as follows:

Per Gross Ton	
Old iron rails	$10.75 to $11.00
Old steel rails, rerolling	10.25 to 10.50
Old steel rails, less than 3 ft.	11.25 to 11.50
Relaying rails, standard section, subject to inspection	22.00 to 23.00
Old carwheels	9.75 to 10.00
No. 1 railroad heavy melting steel scrap	10.00 to 10.25
Shoveling steel	8.75 to 9.00
Frogs, switches and guards cut apart	10.00 to 10.25
Bundled sheet scrap	6.25 to 6.50

Per Net Ton	
Iron angle bars	$10.50 to $11.00
Steel angle bars	8.75 to 9.00
Iron car axles	14.50 to 14.75
Steel car axles	11.25 to 11.50
Wrought arch bars and transoms	12.50 to 12.75
No. 1 railroad wrought	9.00 to 9.25
No. 2 railroad wrought	8.50 to 8.75
Railroad springs	9.00 to 9.25
Steel couplers and knuckles	9.00 to 9.25
Locomotive tires, 42 in. and over, smooth inside	9.50 to 9.75
No. 1 dealers' forge	8.00 to 8.25
Mixed borings	5.50 to 5.75
No. 1 busheling	7.50 to 7.75
No. 1 boilers, cut to sheets and rings	6.00 to 6.50
No. 1 railroad cast scrap	8.50 to 9.00
Stove plate and light cast scrap	7.50 to 7.75
Railroad malleable	7.25 to 7.50
Agricultural malleable	6.75 to 7.00
Pipes and flues	7.00 to 7.25
Railroad sheet and tank scrap	6.75 to 7.00
Railroad grate bars	7.25 to 7.50
Machine shop turnings	6.00 to 6.25

San Francisco

SAN FRANCISCO, CAL., July 6, 1915.

There is little prospect that the trade will get out of the rut into which it has fallen before the middle of September. The movement of jobbing stocks is extremely slow, and there is evidence nearly everywhere that the consumption of steel products has been cut to the absolute minimum. A little export business has appeared, but not enough to offset the local dullness.

Bars.—Small orders for reinforcing material are becoming more numerous, largely in connection with country bridges, and a few inquiries of some importance are appearing. Plain bars find very little demand locally. Some merchants are still carrying German bars and at the present rate of movement do not expect to close them out for some time. A considerable tonnage has been booked for the Orient, which, it is hoped, is the beginning of a more important business. One of the local mills is now operating at about normal capacity, and the price on carloads from mill has advanced to 1.75c.

Structural Material.—The Fourth Street bridge contract is reported let to the Pacific Rolling Mill Company, and some small country bridge contracts have been placed, including one in Monterey county to Dyer Brothers. The Central Iron Works has a small church job at Twenty-third Avenue and Geary Street. Some important public work is in prospect, but is not yet in the market. It includes a new hall at the University of California, for which plans are about ready, and several other buildings at that institution to be figured on later.

Rails.—Mine rails continue in fair demand, and some scattering inquiries are appearing for grooved rails and street railway supplies. Bids will be taken July 14 for the Church Street municipal line, this city. A survey is being made for the contemplated railway into Hetch Hetchy Valley, in connection with the water development project.

Plates.—Oil refinery improvements, particularly of the Shell and associated companies, continue to take a substantial tonnage. Otherwise business is rather quiet, with no large pipe inquiries, though the construction of several steel gold dredges is contemplated in the interior. Carloads to jobbers from store are quoted at 1.90c.

Sheets.—Few mill agents are making any quotation on galvanized, and practically no business is com-

ing out. Jobbers are carrying fair stocks, purchased at much lower prices, and are selling on a basis of about 4.50c., Pittsburgh. Stocks are moving off very slowly, however, as actual consuming needs are light and buyers do not take kindly to current prices. Black sheets find slightly more demand, but are not active. The demand for riveted pipe and well casing is much less than for the last two years at this season.

Wrought Pipe.—The jobbing trade has dwindled considerably in the last few weeks, and most merchants are still amply supplied with both black and galvanized. Consumers are substituting the former wherever possible. The demand for well casing and irrigation goods shows a sharp curtailment from recent years. A few special inquiries are appearing. The Producers' Transportation Company is preparing to lay a water line in western Kern county, requiring 44,000 ft. of 6-in. and 28,000 ft. of 4-in. pipe. The Midway Gas Company has placed an order for about 78,000 ft. of 8-in. casing. The Shell Company has placed orders for several small extensions.

Cast-Iron Pipe.—The Spring Valley Water Company, this city, is placing orders for several hundred tons of small pipe. The town of Phoenix, Ariz., will take bids July 13 for 400 tons. There is little other municipal business immediately in prospect. Following a recent reduction in freight rate, quotations at California terminals show some reduction, being now $29 for 6-in., $31 for 4-in., and $1 extra for gas pipe.

Pig Iron.—Business continues extremely quiet and there is still a considerable tonnage at local warehouses and foundries. Melters still hesitate to make provision for future requirements. There is a limited business in Southern foundry iron, No. 1 being quoted here at $20.50 to $21 per gross ton.

Coke.—Local offerings of foreign coke are gradually decreasing, though the demand is light, and spot prices are well maintained at $14 to $15 per net ton from yard. A number of the larger consumers are using domestic coke, but the tonnage at present is not very large.

Old Material.—Signs of revival in the local rolling mill industry have led dealers to take a firmer view of values, and they are holding for higher prices than can now be realized. Heavy steel melting scrap is still being secured, however, at about $6 to $8 per gross ton, and no shortage is anticipated. Cast-iron scrap is moving in a limited way at about $14 to $15 per net ton.

The Pacific Hardware & Steel Company, San Francisco, is closing its branch warehouses at Seattle, Wash., and Portland, Ore., where a reduction of stocks has been going on since Jan. 1.

New York

NEW YORK, July 14, 1915.

Pig Iron.—While the Buffalo basis of $13 for No. 2 X foundry iron is adhered to by some producers, sales are made at less than this, transactions in New England being reported considerably lower. A machinery manufacturer in that district has closed for 1250 tons of an inquiry for 3000 tons. It is yet to be demonstrated whether the effects of the sharp competition between Buffalo interests for the business taken in March have so far disappeared as to leave no great obstacle to a movement for higher prices. The demand for foundry iron will decide, if it should become insistent, but it has by no means reached that point, and meanwhile foundry buyers seek to get 1916 deliveries at no marked advance over the March basis. More foundry iron is being melted with each month, but the increase is gradual. The malleable syndicate's inquiry for 15,000 to 20,000 tons is understood to be still pending. Some pipe iron has been bought and more is under inquiry. Furnacemen in the East are little concerned apparently over the small imports of merchant ore, as ample domestic ores are available at prices in keeping with the pig-iron market. Some piecing out purchases of Lake ore were made in the past week. Some ore in stock at Eastern furnaces long idle was sold recently at close to 6c. a unit, delivered. Eastern magnetites have sold at 6¾c., delivered, while for Lake Superior ores, eastern deliveries would mean 7c. to 7¼c. Pennsylvania furnace companies are rather firmer in their quotations for iron for late in the year or early in 1916. We quote at tidewater as follows: No. 1 foundry, $14.50 to $14.75; No. 2 X, $14.25 to $14.50; No. 2 plain, $13.75 to $14; Southern iron, $14.50 to $14.75 for No. 1 and $14.25 for No. 2.

Ferroalloys.—No further advices have been received regarding a possible restriction by the British Government of licenses to ship ferromanganese, reported last week. Consignments are being received each week sufficient to supply the immediate needs of consumers, who, however, are not permitted to accumulate stocks. Official information is that 7200 gross tons were shipped to this country from Liverpool in June. Cognizance is taken of the fact that England's receipts of manganese ore from India are constantly dwindling, that none is coming from Russia and that very little reaches there from Brazil. These conditions and the fact of the small amounts reaching this country are the basis of predictions that the price of ferromanganese will advance rather than decline in the not distant future. It is understood that the leading domestic producer has entirely withdrawn from the market. There are numerous inquiries and sales of small lots at $100, seaboard. Samples of domestic electrolytic ferromanganese received by dealers here show an excellent composition as to most elements but are high in silicon, reaching in some cases 3.50 per cent. The market for 50 per cent ferrosilicon is very brisk, the domestic and foreign demand being insistent at $71 to $73, Pittsburgh.

Structural Material.—The firmness which has been gathering weight appears to be due in part to the shortage of steel in that there is a diversion to other forms of finished material in specially heavy demand, and in part to the recent heavy orders for cars which take products from structural rolls, and the result has been an increased inquiry. This comes in part from abroad, from South America and from Europe and Australia, to all of which considerable shipments have already been made. The strength of the situation is also shown by the fact that the Cambria Steel Company has put its price on shapes, plates and bars to 1.30c., Pittsburgh. A better demand for local building work is indicated by the following new projects, some up for figures and others expected shortly to be in the market: Hotel des Artistes, Sixty-seventh Street near Central Park West, 1100 tons; an apartment, Fifth Avenue and Seventy-second Street, 650 tons; a 12-story building, 144th Street and Riverside Drive, 700 tons; a 17-story Fullerton-Weaver apartment, East Forty-seventh Street, 1800 tons; a 16-story loft, 50 West Twenty-third Street, 1500 tons; a garage for the Cadillac Motor Car Company, Long Island City, 350 tons; an American League baseball grand-stand, Long Island City, 1500 tons, and the Degnon building, Long Island City, 900 tons. The New York Central is to build a subway station at Lexington Avenue and Forty-second Street, taking 1400 tons. The contract awards of the week include 1100 tons for the Charmion apartment, West End Avenue, to the Hinkle Iron Company; 1100 tons for the Ayer loft, 29 West Thirty-sixth Street, to the Levering & Garrigues Company; 500 tons for the Ayer Estate, Long Island City, to the George A. Just Company; 250 tons for Ethan Flagg, Yonkers, N. Y., to C. W. Simpson & Co., New York; 200 tons for St. Stephen's Parochial school, Arlington, N. J., to the Hedden Iron Construction Company; 1500 tons for an apartment on Park Avenue between Fiftieth and Fifty-first Streets, to the Passaic Steel Company, and 150 tons for the Fogasso apartment, Washington Place, to Philip Lenges. The Levering & Garrigues Company has also taken an enlarged tonnage for the Backer loft, originally awarded some time ago. Store prices are up $2 a ton. We quote new shipments at 1.25c., Pittsburgh, or 1.419c., New York, and for small lots from store we quote 1.95c. to 2c., New York.

Steel Plates.—With a better demand locally, Eastern mills running close to capacity, and deliveries subject to more delay than lately, the price situation is firmer, as accentuated by the advance to 1.30c., Pittsburgh, made by the Cambria Steel Company, as noted in the preceding paragraph. Reports from car builders are that before long the railroads will come into the market strongly and car prices will therefore, it is expected, stiffen considerably, particularly in the West where competition has been very strong. Among the car inquiries which are expected to crystallize before long into orders may be mentioned 2000 hopper cars and 50 passenger cars for the Baltimore & Ohio; 900 underframes for the Buffalo, Rochester & Pittsburgh; 400 gondolas for the Texas-Pacific, and 300 automobile and 50 caboose cars for the Chicago & Northwestern. The Burlington is considering 1500 box-cars. We quote 1.20c. to 1.25c., Pittsburgh, or 1.369c. to 1.419c., New York, the higher figure being charged for the smaller lots and for fourth quarter. Plates from store are higher, or 1.95c. to 2c., New York.

Iron and Steel Bars.—The belated jobbers' contracts referred to last week have been closed for the quarter at 1.25c., Pittsburgh. The growing shortage of steel is mentioned particularly in this branch of the market and deliveries are not promised in many lines within three months. The Cambria Steel Company has advanced bars to 1.30c., Pittsburgh, for immediate business. In bar iron, with an increasing demand and higher scrap prices, an advance is early expected. Store prices have been advanced $2 a ton, bringing the differential between mill and warehouse to what it was some weeks ago. We quote mill shipments of steel bars at 1.25c., Pittsburgh, or 1.419c., New York, and refined iron bars 1.25c. to 1.30c., New York. Out of store in New York iron and steel bars are 1.90c. to 1.95c.

Old Material.—A decided improvement is noted in demand, not only from steel mills but from both foundries and rolling mills. The result is a pretty general increase in prices, as noted below. Foreign inquiry has been received from China and Italy, though business has not yet resulted in these cases. Brokers' quotations to local dealers and producers, per gross ton, New York, are as follows:

Old girder and T rails for melting	$9.50 to $10.00
Heavy melting steel scrap	9.50 to 10.00
Relaying rails	19.00 to 19.50
Rerolling rails	9.50 to 10.00
Iron car axles (nominal)	15.25 to 15.75
Steel car axles	12.25 to 12.75
No. 1 railroad wrought	10.75 to 11.00
Wrought-iron track scrap	9.75 to 10.00
No. 1 yard wrought, long	9.75 to 10.00
No. 1 yard wrought, short	9.25 to 9.50
Light iron (nominal)	3.25 to 3.75
Cast borings	6.25 to 6.50
Wrought turnings	6.00 to 6.25
Wrought pipe	8.50 to 8.75

Quotations to consumers of cast scrap are as follows, per gross ton, New York:

Old carwheels	$9.50 to $10.00
No. 1 machinery cast	11.00 to 11.50
No. 2 heavy cast	9.75 to 10.25
Stove plate	8.00 to 8.25
Locomotive grate bars	7.50 to 8.00
Malleable cast (railroad)	7.50 to 8.00

Cast-Iron Pipe.—In addition to the public lettings noted last week may be mentioned 800 tons of 6, 8 and 12-in. pipe for Albany, N. Y., to be bid on July 19. The letting on July 19 for the borough of Totowa, Passaic County, N. J., involves 1370 tons of 4 to 10-in. pipe and 30 tons of special castings. Private buying is better and prices are firm, as follows: Carload lots of 6-in., class B and heavier, are quoted at $22.50 to $23, per net ton, tidewater, class A and gas pipe taking an extra of $1 per ton.

For the first time since the new open-hearth plant was completed at the Steelton, Pa., works of the Pennsylvania Steel Company the entire eight furnaces were placed in operation this week. At the same time the new rail mill went on double turn. A large order for steel frogs for the Philadelphia yards of the Pennsylvania Railroad has caused the working time in the frog shop department to be increased. The entire plant is now operating at its greatest capacity this year.

Pittsburgh

PITTSBURGH, PA., July 13, 1915.

The position of the steel market as a whole is better than it was a fortnight ago and it seems quite certain now that July and August will not prove to be dull months, as they usually are. As a rule the steel mills have booked large tonnages since July 1, and are increasing their operations almost as fast as physical conditions at mills will permit. They are making a special effort to divert orders into Bessemer departments as open-hearth departments are generally very well filled. In some finished products delivery promises have so lengthened that they now run from four to eight weeks. Prices are growing firmer on leading products, while such manufactured products as spikes, rivets, chain, etc., are showing a stiffening tendency. The Steel Corporation's showing of unfilled obligations at the end of June is somewhat better than was expected in the trade. The June increase is equal to one-third the corporation's capacity; and as shipments were at the rate of about 80 per cent, the bookings were well in excess of capacity. Pig iron, scrap and coke continue in unsatisfactory position. The local pig-iron market is disturbed by still more aggressive competition on the part of Lake furnaces. Scrap is in poor demand and coke is practically stagnant. These lines are expected to improve if steel mill operations increase to such an extent as to require buying of iron on the outside.

Pig Iron.—The most interesting transaction in the pig-iron market for a long time is the purchase of 40,000 or 50,000 tons of basic iron by the Youngstown Sheet & Tube Company, for it is understood that the iron is to come from a Cleveland furnace about to be blown in and the movement of pig iron from Cleveland to the valleys is quite unusual. The delivered price is understood to have been in the neighborhood of $13, delivered, this being less than the price at which such a large tonnage could have been secured from Valley furnaces. The Valley furnaces have marked up their quotation on basic iron to $13 at furnace and are very firm at this figure. There was sale 5000 at $13, f.o.b. a Shenango Valley furnace, for delivery to a nearby plant. Bessemer pig iron has also advanced and is strong at $14, Valley furnace. We note a sale of 10,000 tons at this figure to a buyer who will probably take more, and sales of two other lots of 2000 and 1000 tons. There seems to be no doubt that a regular movement has commenced in Bessemer and basic iron. Foundry iron is firm at $12.75, Valley furnace. We quote Bessemer iron, $14; basic, $13; No. 2 foundry, $12.75; gray forge, $12.50; malleable, $12.75 to $13, f.o.b. Valley furnaces. An export inquiry has come up for 40,000 tons of Bessemer iron on which the specifications are rather close and $15, Valley furnace, has been quoted, there being other export Bessemer inquiry totaling about 10,000 tons.

Billets and Sheet Bars.—The Youngstown mills are reported as being quite well sold up on open-hearth billets and sheet bars, so that they are not quoting very freely, and even on Bessemer steel somewhat higher prices are being named. The mills are making efforts to fill requirements in Bessemer instead of open-hearth wherever practicable. The Pittsburgh mills have been practically out of the market for some time. Premiums are occasionally being paid for small lots for steel for very quick shipment. Our quotations this week are 50c. higher on both Bessemer and open-hearth. There being practically no quotations from Pittsburgh mills, the Pittsburgh market is made by the Valley quotations, at about $1 a ton higher, the actual freight being $1.05. We quote, f.o.b. maker's mill, Youngstown: Bessemer billets, $20; Bessemer sheet bars, $20.50; open-hearth billets, $21; open-hearth sheet bars, $21.50. Delivered Pittsburgh: Bessemer billets, $21; Bessemer sheet bars, $21.50; open-hearth billets, $22; open-hearth sheet bars, $22.50. Forging billets are quoted at $27 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and lighter carbons. Foreign billets running above 0.25 and up to 0.60 carbon take $1 per ton extra. Axle billets are held at $24.

Ferroalloys.—The English makers seem to be a trifle freer in making contracts for ferromanganese for forward delivery, at their regular price of $100, Baltimore. There is a somewhat heavier movement in prompt material, in small lots, and there are a number of sellers. Prices have become fairly uniform, at $100 to $105, Baltimore basis, and no sales are heard of below $100. We quote 50 per cent ferrosilicon in lots up to 100 tons, at $73; over 100 tons to 600 tons, $72, and over 600 tons, $71, delivered in the Pittsburgh district. We quote 10 per cent ferrosilicon at $17; 11 per cent, $18; 12 per cent, $19, all f.o.b. cars at furnace Ashland, Ky., Jackson, or New Straitsville, Ohio, each of these points having a rate to Pittsburgh of $2 per gross ton. We quote 20 per cent spiegeleisen at $25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads, 10c. in 2000-lb. lots and over, and 12½c. in smaller lots.

Structural Material.—Demand has been showing a slight improvement and the market is considered firmer than it was a week or two ago. We quote the market at 1.25c. for third quarter and 1.30c. for fourth quarter, for beams and channels 15 in. and under.

Plates.—It appears that none of the plates and only a portion of the other steel required for filling the car orders for the Russian government have yet been placed with the mills here. The Standard Steel Car Company is reported to have booked an order from the Havana Central for 660 cars. The plate market is rapidly firming up, as the large mills are well filled with business and the smaller mills are booking an increasing tonnage. We quote plates ¼ in. and heavier at 1.20c. to 1.25c., Pittsburgh.

Steel Rails.—No new orders of importance have been booked for rails, but the mills are receiving better shipping orders on contracts already placed and are now operating at a fair rate. We quote standard section rails of Bessemer stock at 1.25c., and of open-hearth, 1.34c., f.o.b. Pittsburgh. We quote light rails as follows, in carload lots: 8 and 10-lb. sections, 1.275c.; 12 and 14-lb., 1.225c.; 16 and 20-lb., 1.175c.; 25, 30, 35, 40, and 45-lb. sections, 1.125c. The prices of light rails are materially shaded on large lots.

Tin Plate.—The continued heavy demand for tin plate for export is serving to stiffen the position of the mills, and they are hardly as ready to quote as they were a fortnight ago. Specifications from the domestic trade continue of fair proportions. The mills are operating at the same rate as formerly, about 95 per cent of capacity, and despite the summer weather are getting out approximately as large tonnages as usual. On new orders we quote 14 x 20 coke plates at $3.10 to $3.25 per base box, but on a very desirable order for delivery ahead the $3.10 price might be shaded, but not over 5c. or 10c. per box.

Sheets.—The black sheet market is reported as being a shade firmer, particularly for special grades. The demand from the automobile trade is increasing constantly. Blue annealed sheets are firming up somewhat, and while 1.30c. is still done 1.35c. is being obtained in an increasing number of cases. Demand for galvanized sheets continues light, with prices irregular. Corrugated sheets are being quoted on the basis of 1.70c. to 1.75c. with the usual 0.20c. extra for corrugating and painting. We quote No. 28 Bessemer black sheets at 1.75c. to 1.80c.; No. 28 galvanized, 4.50c. to 5.25c.; Nos. 9 and 10 blue annealed sheets, 1.30c. to 1.35c.; No. 30 black plate, tin-mill sizes, H. R. & A., 1.95c.; No. 28, 1.90c.; Nos. 27, 26, and 25, 1.85c.; Nos. 22 to 24, 1.80c.; Nos. 17 to 21, 1.75c.; Nos. 15 and 16, 1.70c. The above prices are for carload lots, f.o.b. at maker's mill, jobbers charging the usual advances for small lots from store.

Wire Rods.—Demand for rods continues good, there being fair specifications from domestic consumers, while the demand for export is still heavy. We quote Bessemer, open-hearth, and chain rods at $25.50 to $26 for domestic, while $26 or higher is being asked by mills that can quote for foreign delivery.

Carwheels.—The producers of steel wheels are operating at a better rate than for about a twelvemonth and are having a moderate amount of new inquiry. We quote standard 33-in. freight carwheels, 6¼-in. rough bore, at $16, and standard 36-in. passenger, the same bore, at $22.50 per wheel, f.o.b. Pittsburgh.

Shafting.—The shafting market is improving steadily, with heavy specifications on old contracts and producers working more nearly at capacity than at any time for a year or more. On new business, which is relatively light, sellers are adhering rather firmly to 66 per cent in carload lots and 61 per cent in less than carloads, f.o.b., Pittsburgh.

Hoops and Bands.—While the demand for cotton ties this season will probably be somewhat less than a year ago the mills have no foreign competition and are adhering to their season price of 85c. per bundle, for July shipment, with ½c. advance for each later month. Last season's price was 65c., when hoops were at about the present level. Hoops and bands are firmly maintained at prices already quoted.

Wire Products.—While the advanced prices on wire products are nominally in effect, the mills are not hesitating to cover regular customers at former prices, in case they had not already taken out contracts. The test of wire prices will come later as existing contracts run out. We quote plain annealed wire at $1.40; galvanized barb wire and fence staples, $2.50; painted barb wire, $1.70, all f.o.b., Pittsburgh, with freight added to point of delivery, terms 30 days net, less 2 per cent off for cash in 10 days. Woven wire fencing is quoted at 69 per cent off in carload lots, 68 per cent on 1000-rod lots, and 67 per cent on small lots, f.o.b., Pittsburgh.

Skelp.—Steel skelp has firmed up in sympathy with advanced prices ruling for merchant bars and plates. There is a fair demand, particularly for moderate sized lots for early shipment. Iron skelp is quiet and is not quotably changed. We quote grooved steel skelp at 1.20c.; sheared steel skelp, 1.25c.; grooved iron skelp, 1.60c. to 1.65c., and sheared iron skelp, 1.70c. to 1.75c., delivered to consumers' mills in the Pittsburgh district.

Iron and Steel Bars.—Specifications for steel bars are increasing in volume, particularly from the agricultural implement trade. The heavy demand for large rounds for shells continues and is expected to show no diminution while the war lasts. The bi-monthly adjustment of wages in the iron mills under the Amalgamated Association wage scale was made in Youngstown yesterday, and gave the men an advance, that of the puddlers being to $5.70 a ton, as the average realized price on bar iron shipments in June was found to be between 1.10c. and 1.15c. The mills are quite firm at 1.25c. for third quarter or second half, and sometimes quote 1.30c. for fourth quarter, while predictions are made that before the end of next month the whole market will be 1.30c. Iron bars continue in relatively poor demand. We quote steel bars at 1.25c. for third quarter; common iron bars made from part scrap, 1.25c. to 1.30c., and test-iron bars at 1.35c. to 1.40c., f.o.b. Pittsburgh.

Railroad Spikes.—Specifications on spike contracts are good and producers are disposed to ask higher prices on new business, sometimes quoting $1.45 on railroad spikes, though it is possible that in exceptional cases $1.40 has been shaded a trifle in the past ten days. We quote standard sizes of railroad spikes at $1.40 and small railroad and boat spikes at $1.50 per 100 lb., f.o.b. Pittsburgh.

Rivets.—Specifications on contracts are quite satisfactory, and an increasing volume of new business is being booked. We quote the market at $1.50 per 100 lb. for button-head structural rivets and for conehead boiler rivets at $1.60 per 100 lb. in carload lots, f.o.b. Pittsburgh, smaller lots bringing from 5c. to 10c. advance, depending on the order. There is practically no shading of structural rivets, even on large lots, but boiler rivets in large lots are occasionally shaded 5c. per 100 lb.

Cold-Rolled Strip Steel.—The market is fairly strong on the recent advance in prices, and mills are in receipt of good specifications, so that they are operating to better advantage than at any time for a year. We quote hand-rolled steel, 1½ in. and wider, under 0.20 carbon, sheared or natural mill edge, per 100 lb., $2.85, deliv-

ered. Extras, which are standard among all the mills, are as follows:

Thickness, in.	Extras for thickness	Extras for soft or intermediate tempers	Extras for straightening and cutting to lengths not less than 24 in.
0.100 and heavier	Base	$0.25	$0.10
0.099 to 0.070	$0.05	0.25	0.15
0.069 to 0.055	0.20	0.25	0.15
0.054 to 0.047	0.35	0.40	0.25
0.046 to 0.035	0.45	0.40	0.40
0.034 to 0.029	0.55	0.40	0.50
0.028 to 0.025	0.85	0.50	1.10
0.024 to 0.018	1.25	0.50	1.10
0.017 to 0.015	1.95	0.50	1.25
0.014 to 0.013	2.30	0.50	coils only
0.012	2.65	0.50	coils only
0.011	3.00	0.50	coils only
0.010			

Merchant Steel.—Demand for various merchant steel products is fairly active, seasonably, and is showing no signs of summer dullness. Prices in small lots are as follows: Iron finished tire, ½ x 1½ in. and larger, 1.40c., base; under ½ x 1½ in., 1.55c.; planished tire, 1.60c.; channel tire, ¾ to ⅞ and 1 in., 1.90c. to 2c.; 1⅛ in. and larger, 2c.; toe calk, 2c. to 2.10c., base; flat sleigh shoe, 1.75c.; concave and convex, 1.80c.; cutter shoe, tapered or bent, 2.30c. to 2.40c.; spring steel, 2c. to 2.10c.; machinery steel, smooth finish, 1.80c.

Nuts and Bolts.—The new prices on nuts and bolts as adopted by leading makers on June 30 are reported to be well maintained, but there is not a great deal of new buying to test the market. All buyers specified quite freely in June, particularly toward the latter part of the month, and the large buyers were protected by contracts for limited periods at the old prices. Discounts to the trade as adopted June 30 are as follows:

U. S. S. Cold Punched Blank and Tapped, Chamfered, Trimmed and Reamed

½ in. and smaller, hex.....7.8c. per lb. off
⅝ in. and larger, hex.....7.1c. per lb. off
Square, all sizes.....5.6c. per lb. off

Semi-Finished Tapped

½ in. and smaller hex.....85-10-10-5 off
⅝ in. and larger hex.....85-10-5 off

Black Bulk Rivets

7/16 x 6½, smaller and shorter.....80-10-5 off

Package Rivets 1000 Pcs.

Black, metallic tinned and tin plated....75-10-10 off

Discounts on bolts as recently adopted are as follows:

Common carriage bolts, ¾ x 6, S. & S. rolled, 70-10-10; cut, 75-10-5; larger or longer, 75-5. Machine bolts, h. p. nuts, ⅜ x 4, S. & S. rolled, 75-2/10-5; cut, 75-2/10; larger or longer, 75-5. Machine bolts with C. P. & C. & T. nuts, ⅜ x 4, S. & S., 75-10; larger or longer, 75. Bolts without nuts, 6 in. and shorter extra 10 per cent; longer lengths, extra 5 per cent. C. P. coach screws, 75-2/10-5. Nuts, blank or tapped, h. p. square, 6.20; hexagon, 7.00.

Wrought Pipe.—Demand for merchant pipe thus far this month has been fully equal to that of June and the market is regarded as being in very satisfactory condition. The mills are operating at 75 to 80 per cent of capacity, and this is doing very well considering the light demand for oil country goods. The National Tube Company has booked an order for 200 miles of 8-in. line pipe for early delivery, which will require about 20,000 tons of steel in the manufacture.

Boiler Tubes.—Demand for boiler tubes has shown no decrease this month and prospects are for a steady and increasing demand. Discounts are reported as being well maintained.

Old Material.—The market on some descriptions of scrap, particularly melting steel grades, is somewhat softer. Heavy melting steel is affected by the position of the mills with respect to scrap already bought, as on the whole they are taking only light deliveries. There has been an embargo at Monessen since July 2 and in the first week of the embargo the number of unloaded cars at destination increased. Four or five other consumers have notified dealers to decrease their shipments, and the dealers have found some difficulty in giving shipping instructions upon scrap that had to be moved. Wrought turnings continue to feel the effect of the greatly increased production, due to the manufacture of shrapnel, and prices are constantly falling. One plant in the Pittsburgh district is now producing fifteen cars a week of shrapnel turnings and is expected to be producing twenty-five cars before long. It is difficult to secure bids from dealers at $7.50, while consumers can buy almost any tonnage desired at $7.75. Cast borings have suffered also, perhaps from sentimental influences, and are quotable 50c. to 75c. lower.

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	$11.75 to $12.00
Compressed side and end sheet scrap	11.75 to 12.00
No. 1 foundry cast	12.25 to 12.50
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	9.25 to 9.50
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	11.75 to 12.00
No. 1 railroad malleable stock	10.50 to 10.75
Railroad grate bars	8.50 to 8.75
Low phosphorus melting stock	15.25 to 15.50
Iron car axles	18.75 to 19.25
Steel car axles	13.25 to 13.75
Locomotive axles, steel	19.75 to 20.25
No. 1 busheling scrap	10.25 to 10.50
No. 2 busheling scrap	7.25 to 7.50
Machine shop turnings	7.50 to 7.75
Old carwheels	11.75 to 12.00
Cast-iron borings	8.00 to 8.25
*Sheet bar crop ends	12.00 to 12.25
Old iron rails	12.75 to 13.00
No. 1 railroad wrought scrap	10.75 to 11.00
Heavy steel axle turnings	8.50 to 8.75
Heavy breakable cast scrap	10.75 to 11.00

*Shipping point.

Coke.—The prompt furnace coke market has become dull again, after the little flurry over the national holiday, when dealers and operators marked up prices, and the currently quoted price is down to $1.60 again, with buyers showing no interest. There do not seem to be any important negotiations on for contract furnace coke, and the market is practically nominal. In Pittsburgh coke circles no credence is given to the statement in last week's Connellsville *Courier* that a contract for standard furnace coke for third quarter was made at $1.85. Foundry coke is moderately active and there is some buying of prompt by consumers who did not close their usual annual contracts prior to July 1. We quote prompt furnace coke at $1.60, contract furnace coke, nominal, at $1.75, for delivery to January 1, prompt foundry coke at $2 to $2.25 and contract foundry coke at $2.25 to $2.50, per net ton at oven. The Connellsville *Courier* reports production in the Connellsville and lower Connellsville regions in the week ended July 3 at 371,414 tons, an increase of 15,936 tons, and shipments at 376,957 tons, an increase of 30,580 tons.

British Market Firm

Further Restrictions of Ferromanganese Possible —Exports of High Grade Steel Prohibited

(*By Cable*)

LONDON, ENGLAND, July 14, 1915.

The pig-iron market is somewhat affected by fears of further export restrictions. Business is improving slightly but is far below normal. Hematite iron is quiet and easier but makers are rather anxious for business. Forward sales are reported at 97s 9d ($23.78). Semi-finished steel is firm but business is restricted because of the unfavorable position of the galvanizing and tin-plate works. Furnaces in blast are 160 against 165 a year ago. Welsh bars are very firm and tin plate is quieter. A general strike in the South Wales collieries is promised for Thursday.

It is reported that ferromanganese export restrictions may be tightened, it being alleged that material is being smuggled into Germany. American 2-in. billets have been sold at £7 6s. 3d. ($35.58), c.i.f., Liverpool. The admiralty has prohibited the export of high grade steel containing ferroalloys and a committee has been appointed at Sheffield to deal with applications for export. We quote as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 19s. ($4.62).

Cleveland pig-iron warrants, 67s. 6½d. ($16.43), against 67s. 7d. ($16.44), last week.

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlesbrough, 67s. 9d. ($16.48).

Steel black sheets, No. 28, export, f.o.b. Liverpool, £11 15s. ($57.18).

Steel ship plates, Scotch, delivered local yards, £10 ($48.66), compared with £9 15s. ($47.44) a week ago.

Steel rails, export, f.o.b. works port, £8 17s. 6d. ($43.19), against £8 15s. ($42.58) last week.

Hematite pig iron, f.o.b. Tees, 98s. ($23.85), against 100s. ($24.33) last week.

Sheet bars (Welsh), delivered at works in Swansea Valley, £7 10s. ($36.49).

Steel joists, 15 in., export, f.o.b. Hull or Grimsby, £10 ($48.66).

Steel bars, export, f.o.b. Clyde, £10 15s. ($52.31).

Ferromanganese, f.o.b., £20 15s. ($100.98).

Ferrosilicon 50 per cent, c.i.f., £15 5s. ($74.21), against £14 5s. ($69.35) a week ago.

Pig-Iron Stronger—Manganese Ore Situation—Merchant Steel Output Low

(By Mail)

LONDON, ENGLAND, June 30, 1915.

More business is being done in pig iron. Consumers are finding it necessary to enter contracts for forward deliveries, now that the end of the half-year has terminated those under which they were previously obtaining their supplies. The export trade has been on a more liberal scale, and the clearances in June promise to be well ahead of those of any month this year, though leaving enormous room for improvement. Higher freight rates by rail are coming into force now between the Cleveland district and Scotland, and this may tend to restrict the amount of business which is done in the brands of iron favored by consumers north of the Tweed. The position of the iron trade in other districts is strong, and so long as coke prices keep up it seems useless to anticipate any abatement in the conditions which have to be faced.

Trade in hematite is quiet, but the tone seems to be slightly firmer. Within the last few days some business has been done with Sheffield, and permits are understood to have been issued for the shipment of a considerable tonnage to Italy. The definite political action taken by Italy will no doubt have a stimulating effect upon the Cleveland iron trade, because while that country was sitting on the fence there was a natural reluctance to permit unrestricted exports of metals to be made to her. The general price of mixed numbers of East Coast hematite is about 100s. ($24.33), a figure well below the highest level recorded, the reduction in price being due to the heavy imports of foreign ore which have had to be dealt with, at a time when consumers were already very well stocked.

MANGANESE AND THE DARDANELLES

There is not much doing in ferromanganese, but a few sales of Indian manganese ore have been made at firm prices. Of course, should the Allies succeed in forcing the Dardanelles, a new situation will be created, but judging from the general feeling in the market the resumption of shipments of manganese ore from South Russia is a possibility too remote to deserve serious consideration.

There are no special features in the market for semi-finished material. Welsh sheet bars had a setback a week or so ago, principally because the galvanized sheet trade is paralyzed, and makers of steel bars, unable to induce makers of galvanized to accept deliveries, were forced to find a market in other directions. Down to £7 5s. ($35.28) seems to have been accepted for Welsh bars delivered at local works. The market is better now and may be quoted £7 10s. to £7 15s. ($36.49 to $37.71). American material has an upward tendency, and as much as £7 5s. ($35.28) is asked to-day for 2-in. billets and sheet bars, c.i.f. Liverpool.

In all directions in the finished steel trade a very firm tone prevails. The output of merchant products gets steadily smaller and each week sees more determined efforts to concentrate energies upon the production of war material.

The Pennsylvania State Industrial Board is formulating a new sanitation safety code for foundries. Final action will be taken next month.

Metal Market

NEW YORK, July 14, 1915.

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York			Lead		Spelter	
July	Lake	Electrolytic	Tin, New York	New York	St. Louis	New York	St. Louis
7	22.00	19.62½	28.62½	5.75	5.60	22.50	22.25
8	22.00	19.50	38.37½	5.75	5.60	22.80	22.55
9	22.00	19.50	38.90	5.75	5.60	22.50	22.25
10	22.00	19.50	.....	5.75	5.60	22.25	22.00
12	22.00	19.50	38.62½	5.70	5.55	22.00	21.75
13	22.00	19.50	38.12½	5.65	5.50	22.00	21.75

Copper is dull and lower. Tin has declined and is uninteresting. Lead is weaker and uncertain. Spelter is easier because of freer offerings. Antimony is lower under slight pressure to sell.

New York

Copper.—The market is dull and the almost complete lack of business, both on domestic and foreign account, has led to offerings at concessions by second-hands. All prices are nominal. The producers are asking 20c., full terms, New York, for electrolytic, while second-hands ask 19.50c. cash, and there are reports of offerings at ⅛c. lower. So far as can be ascertained the large war orders talked of for some weeks have not been placed. The exports are making a poor showing this month, as to date they total but 4887 tons. Domestic deliveries against old purchases are unquestionably good. High grade Lake is quoted at about 22c. cash, New York, with the less favored grades ranging down to 20c. cash.

Tin.—Consumers are well covered for some time ahead and consequently are showing no interest in tin. The dullness and the fact that the supplies are more than ample have brought prices down, and 38.12½c., New York, was quoted yesterday. The arrivals this month total 2609 tons, the bulk of which has been shipped to consumers. The quantity afloat is 5710 tons, all of which is scheduled to arrive this month, except 825 tons, due Aug. 1. Yesterday there was a little show of interest on the part of consumers, but it did not result in buying.

Lead.—In the latter part of last week, the market took on a stronger tone, but the strength dwindled away this week and the situation is now one of heavy dullness, with prices lower. The New York quotation yesterday was 5.65c., with St. Louis at 5.50c. Lead is considered the most sensitive of all the metals at this time, with the supply and demand closely related. The foreign business has been lighter, which is reflected in the exports; these total but 894 tons this month. In the past few days there have been some inquiries on behalf of Italy, but they did not result in business here, and Spain may have supplied the demand. The indisposition of England to permit the export of metals from that country is regarded as a strengthening influence, as it may cause other nations to seek their supply from the United States exclusively.

Spelter.—Late last week some good round lots of spelter were taken by consumers and prices became stronger, but since then the market has become dull and prices are easier. The quotations yesterday for prompt delivery were about 22c., New York, and 21.75c., St. Louis. At present there is some export inquiry before the trade. Last week, sales were made at 22.50c. to 23c. for prompt; 22c. for August, and 20c. for the last quarter. Sales for delivery as far ahead as May have been made at 18c. Very choice grades, such as Bertha and Horsehead, have been quoted at 40c. The miners' strike in the Joplin district was ended early this week, and this had a softening influence on the market. It is understood no concessions were given. Many of the galvanized sheet manufacturers are still avoiding the purchase of spelter. The exports this month total 1133 tons.

Antimony.—Offerings of recent arrivals of Chinese and Japanese antimony has brought about a weaker market and 36c., duty paid, or 34½c. in bond is now quoted. It is highly probable that these prices might be shaded. Buyers have been conservative.

Old Metals.—The market remains quiet. Dealers' selling prices are as follows, but are wholly nominal:

	Cents per lb.
Copper, heavy and crucible	18.25 to 18.75
Copper, heavy and wire	18.00 to 18.50
Copper, light and bottoms	15.50 to 16.00
Brass, heavy	13.50 to 14.00
Brass, light	11.50 to 12.00
Heavy machine composition	14.50 to 15.00
No. 1 yellow rod brass turnings	14.00 to 15.00
No. 1 red brass or composition turnings	12.50 to 13.00
Lead, heavy	5.00
Lead, tea	4.75
Zinc, scrap	12.00

Chicago

JULY 12.—The market is well sustained in the face of considerable reselling of metals which have offered a speculative opportunity. Spelter is held at 22c., although sales in quantity are reported at 21c. The smelter price for zinc is 27c., but transactions are noted as low as 25c. Copper prices are slightly easier. We quote: Casting copper, 19.25c.; Lake copper, 19.75c. to 20c.; tin, carloads, 39.25c.; small lots, 42c.; lead, 5.60c. to 5.70c.; spelter, nominally, 22c.; sheet zinc, nominally, 27c.; Cookson's antimony, 50c. to 52c.; other grades, 39c. to 40c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 16c.; copper bottoms, 15c.; copper clips, 15.75c.; red brass, 13c.; yellow brass, 12.75c.; lead pipe, 4.75c.; zinc, 8c.; pewter, No. 1, 23c.; tinfoil, 33c.; block tin pipe, 36c.

St. Louis

JULY 12.—The non-ferrous metals have been rather quiet, though there have been some price changes. Lead is quoted to-day at 5.80c.; spelter, 23½c.; tin, 42c.; Lake copper, 21c.; electrolytic copper, 20.50c.; antimony, 40c. In the Joplin ore district the settlement of the strike came late in the week and did not have much effect on ore prices. The cut in production, with the sharp demand, held prices up to a range from $85 to $110 for 60 per cent zinc blende, with the premium ore settlement running to $113. Calamine sold for $50 to $55 per ton, basis range, with the top price about $60. Lead ore was unchanged at $60 per ton. Miscellaneous scrap metals we quote as follows: Light brass, 9½c.; heavy yellow brass, 10½c.; heavy red brass and light copper, 12¼c. to 12½c.; heavy copper and copper wire, 15½c. to 15¾c.; tinfoil, 32c.; pewter, 25c.; lead, 4½c.; zinc, 13c.; tea lead, 3½c.

Larger Domestic Output of Chrome Ore in 1914

The domestic output and sale of chromic iron ore, or chromite, as reported by J. S. Diller, of the U. S. Geological Survey in a special bulletin, was 591 gross tons in 1914, valued at $8,715 or $11.19 per ton, against 255 tons in 1913, valued at $2,854 or $14.75 per ton, a gain of nearly 132 per cent in tonnage and of more than 205 per cent in value over 1913. Most of this came from one mine in Shasta County, Cal. American users of chromium, especially as ferrochrome in making chrome and high-speed steels, were dependent on imported chrome ores before the war, and these are now more difficult to obtain. The imports of such ore in 1914 were 80,736 tons, against 65,180 tons in 1913. The exports of chrome ore from Greece in 1914 were 8155 gross tons, valued at $73,061, against 4600 tons in 1913.

The working schedule in numerous departments of the West Milwaukee locomotive and car shops of the Chicago, Milwaukee & St. Paul Railway Company at Milwaukee has been reduced from five to four days a week. Recently the working schedule was extended and the force increased to take care of rush orders on car and engine repairs. The rush is now over and to avoid reduction of the working force, the hours have been shortened. About 3100 employees are affected.

The American Steel Foundries expects to make steel in its new 6-ton Heroult furnace at Indiana Harbor, Ind., about July 15.

Iron and Industrial Stocks

NEW YORK, July 14, 1915.

In the latter half of last week there was a downward movement in values on the New York stock market, representing continued liquidation of American securities held abroad and the apprehension over the German note respecting submarine warfare; but beginning Saturday and since generally sustained the movement in prices has been upward. The strength has been in industrials, attributable to the large volumes of war business. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com.	16⅝ - 18¼	Lackawanna Stl.	43½ - 47
Allis-Chal., pref.	52½ - 56½	Nat. En. & Stm., com.	16 - 17
Am. Can, com.	44 - 51⅝	Pressed Stl., com.	43½ - 49½
Am. Can, pref.	100 - 103	Ry. Steel Spring, com.	29 - 32
Am. Car & Fdy., com.	52¼ - 55½	Republic, com.	27⅝ - 30⅜
Am. Car & Fdy., pref.	114	Republic, pref.	86⅞ - 90
Am. Loco., com.	42⅝ - 50⅜	Rumely Co., com.	2⅜ - 2¾
Am. Loco., pref.	96¼	Rumely Co., pref.	5¼ - 6½
Am. Stl. Fdries.	35¼ - 39	Sloss, com.	31⅛ - 35½
Bald. Loco., com.	65¼ - 69¼	U. S. Steel, com.	58⅛ - 62
Bald. Loco., pref.	101⅝ - 102	U. S. Steel, pref.	109¼ - 110
Beth. Steel, com.	164¼ - 178½	Va. I. C. & Coke	40
Beth. Steel, pref.	116½ - 117	West'gh'se Elec.	95½ - 101¾
Colo. Fuel	30¼ - 33⅛	Am. Ship, com.	33 - 37
Deere & Co., pref.	90 - 92	Am. Ship, pref.	72
General Electric.	161¼ - 168	Chic. Pneu. Tool.	55 - 56½
Gt. No. Ore Cert.	33¼ - 35⅞	Cambria Steel	47¼ - 50½
Int. Harv. of N. J., com.	97 - 98	Lake Sup. Corp.	8 3/16 - 9¾
Int. Harv. of N. J., pref.	110	Pa. Steel, pref.	56
Int. Harv. Corp., com.	60	Cruc. Steel, com.	30¾
		Cruc. Steel, pref.	89 - 90
		Harb.-Walk. Refrac., pref.	99

Dividends

The New Jersey Zinc Company has declared a dividend of 250 per cent, payable July 21, in common stock.

The Willys-Overland Company, regular quarterly, 1½ per cent on the common stock, payable Aug. 1.

The International Nickel Company, regular quarterly, 1½ per cent on the preferred stock, payable Aug. 2.

Secondary Metals Recovered in 1914

Stocks of secondary metals, those recovered from waste scrap, were fairly large in the United States at the beginning of 1914 and metal prices were low during most of the year, so that the trade in waste metals and drosses was smaller in volume and less profitable than usual, according to J. P. Dunlop of the U. S. Geological Survey in a special bulletin, "The Recovery of Secondary Metals in 1914." The advancing metal prices in the latter part of the year and good stocks of most metals available to take advantage of higher prices made more favorable trade conditions, with the result that business for the year was not as bad as anticipated. Reports were made by about 550 users of secondary material. The following table shows the recovery of secondary metals in the United States in net tons for 1913 and 1914:

Metal	1913	1914
Secondary copper, including that in alloys other than brass	66,980	58,556
Remelted brass	99,315	99,038
Secondary lead	33,104	29,337
Recovered lead in alloys	39,730	31,725
Secondary spelter	50,005	42,969
Recovered zinc in alloys other than brass	3,743	3,914
Secondary tin	6,415	4,535
Recovered tin in alloys	7,763	7,912
Secondary antimony	45	1
Recovered antimony in alloys	2,660	2,645
Secondary aluminum	2,198	2,791
Recovered aluminum in alloys	2,456	1,731
Total	314,414	285,154

The value of these recovered metals in 1914 was $57,639,706, as compared with $72,786,027 in 1913, the decrease being due partly to smaller output and partly to lower average prices for copper, zinc, lead, tin and aluminum.

The ramifications of foreign war demand are illustrated by an inquiry which has come to this country for 30,000 galvanized malleable castings for stretchers.

Minette Iron Ores of the Lorraine District

The Basis of More Than Half Europe's Pig Iron—What These Deposits Mean to German, French and Belgian Steel Trades

BY H. H. CAMPBELL

For 1500 years it has been known that iron ore existed in what we now know as German and French Lorraine and iron has been made there during all that time; but there have always been difficulties from the low percentage of iron. In olden times men did not have chemical laboratories, but they did not need chemists to realize that in a Catalan hearth it was necessary to use perhaps five tons of this ore and several tons of charcoal to make a ton of wrought iron. Moreover, when steel was made, it was not equal in quality to that made from the pure ores of Styria or Elba or northern Spain, and although men did not know at that time what phosphorus was, they did appreciate a good axe or a good sword.

The invention of the blast furnace in the fourteenth century did not help matters and the introduction of the acid Bessemer process about 1860 did not change the situation at all, because the pig iron made from this ore carries altogether too much phosphorus for any acid process. Thus we find that forty years ago the ore in this locality was not considered very highly and it had received from the French workmen the name Minette, which is a diminutive implying contempt. The word is no longer used with this meaning. "The stone which the builders rejected, it is become the head of the corner."

MINETTE ORES AND BASIC BESSEMER

This was the situation at the close of the Franco-Prussian War in 1871. When Germany claimed and France relinquished Alsace-Lorraine, both countries were influenced by political, military and sentimental considerations, but neither of them appreciated the value of the territory as an economic asset. They could not have been expected to know this, because it did not become really important until after the invention of the basic Bessemer process in England in 1878. This method of making steel was just suited for the Minette ores and there was immediately a rapid development of basic steel manufacture in Westphalia. Here we find the best coking coal on the continent of Europe and this has created the steel works at Ruhrort, Hoerde, Dortmund and Essen. The increase in the production of steel in Germany in the last thirty years will be shown by the following figures:

1880.....	661,000 tons	1910.....	13,699,000 tons
1890.....	2,162,000 tons	1912.....	17,302,000 tons
1900.....	6,646,000 tons		

It is not only in Germany that the steel business has been developed from the Minette ores, for both France and Belgium have shared in the benefits, while the grand duchy of Luxemburg derives much of its importance from possessing a considerable share of the mineral. Luxemburg has a special treaty with Germany by virtue of which its output of iron ore, pig iron and steel are very often, if not usually, combined with the output of Germany. Thus we have the production of the Minette field divided up among three nations and a minor principality, so that we are apt to lose sight of the importance of this deposit and we can only find the truth by combining the figures for the different countries.

In German Lorraine and in the southern part of the Rhine province as well as in Luxemburg, the Minette ore constitutes the entire burden of the blast furnaces and these divisions produce nearly forty per cent of the total pig iron made in Germany. Eastern France makes nearly seventy per cent of the total output of pig iron made in that country and here, in the district known as the Meurthe and Moselle, the Minette ores are used exclusively. In Westphalia, which is the best known iron and steel district on the continent, they are used in quantity sufficient to account for two-thirds of its pig-iron production.

BASIS OF HALF OF EUROPE'S PIG IRON

In the year 1910, the output in the various districts mentioned represented 14,372,000 tons of pig iron, which is 70 per cent of the total output for Germany, Luxemburg, France and Belgium combined. Omitting Great Britain and taking the total for all the rest of Europe, including Germany, France, Belgium, Russia, Austria-Hungary, Italy, Spain and Sweden, we find that all these countries produced a total of 26,957,000 tons of pig iron, while this Minette district, as above stated, accounted for 14,372,000 tons. Thus we have more than half the pig iron of all Europe made from this deposit. Great Britain in 1910 produced 10,012,000 tons of pig iron, and about half of this came from imported ore. The amount made from native ores was a great deal less than half the amount made on the continent from the Minette ores.

It is not so easy to give accurate data about the amount of steel made from Minette ores. All the figures on steel production give the tonnage of ingots made and of course, when these ingots are rolled, scrap is produced which goes to the melting furnace and within twenty-four hours perhaps this metal appears again as production. We might say that some of the metal and therefore some of the ore will appear a hundred times on the tonnage report in the course of a year. In many cases the steel is rolled two or three times, while in addition a great deal of scrap is made in the shops where it is used.

Moreover, there is always a large amount of old material going to the furnaces to be remelted, so that we cannot tell just how much steel is made from any particular kind of ore. But we know that in German Lorraine, in the valley of the Saar, in Luxemburg and in French Lorraine all of the steel is made from Minette ore. In Belgium probably 90 per cent comes from the same source, for the only other ore used in that country is a little imported from Spain. Conditions are more complicated in Westphalia, but we know that many works there use this ore almost exclusively for making steel.

LARGE INCREASE IN STEEL FROM MINETTE ORE

We may judge also by the increase in iron and steel production in the countries supplied by the Minette deposit. The following tables give the figures for Germany, France and Belgium; and for comparison, those for the United States and Great Britain also. To avoid being misled by the results

of some abnormal year, each column represents the average of two years. The first column gives the average production in 1900 and 1901 and the second column the average for 1910 and 1911, while the third column shows the gain in per cent. The Continental production is given in metric tons; the figures for Great Britain and the United States represent gross tons.

Table Showing Increase in Production of Pig Iron in Ten Years

	Average, 1900 and 1901	Average, 1910 and 1911	Per Cent Gain in Ten Years
Germany	8,200,000	15,164,000	85
France	2,552,000	4,229,000	68
Belgium	892,000	1,979,000	122
Total	11,644,000	21,372,000	84
Great Britain	8,445,000	9,866,000	17
United States	14,834,000	25,476,000	72

Table Showing Increase in Production of Steel in Ten Years

	Average, 1900 and 1901	Average, 1910 and 1911	Per Cent Gain in Ten Years
Germany	6,520,000	14,359,000	120
France	1,495,000	3,536,000	137
Belgium	591,000	2,069,000	250
Total	8,606,000	19,964,000	132
Great Britain	4,999,000	6,418,000	28
United States	11,831,000	24,885,000	110

It will be evident that whether we consider Germany, France and Belgium separately or combine them into one unit as beneficiaries of the Minette field, we find that during the ten-year period they increased their output of both iron and steel more than the United States and many times as much as Great Britain. If any country had a supply of ore which was not well fitted for making steel, it could not show such an increase in production. We may also find of interest the ratio between the output of pig iron and the output of steel and the following table gives the tons of steel made for every 100 tons of pig iron:

Table Giving the Tons of Steel Made for Every Hundred Tons of Pig Iron

	Average, 1900 and 1901	Average, 1910 and 1911
United States	80	98*
Germany	80	95
France	59	84
Belgium	66	105
Great Britain	59	65

*101 per cent in 1913.

It will be seen that Belgium produced more steel in proportion to her output of pig iron than any of the other nations given in the table and she uses Minette ore mostly. France makes a less proportion than the United States, but this does not arise from her use of Minette ores, because the eastern district which uses these exclusively makes two thirds of all the steel of France. Great Britain produces the least steel in proportion to her pig iron and she increased least in the ten-year period because her native ores are not very well adapted for making steel.

ORE SUPPLY FOR 100 YEARS

From all these considerations it is evident that the Minette district is one of the great factors in the steel industry and it is important to know how long the supply of ore will last. Here as in every such case, we must decide as to what we are to consider as good ore. The mineral is uniformly low in sulphur and it carries phosphorus enough to give about 2 per cent in the pig iron. The iron varies greatly and in the same vertical drill hole we may find the content ranging from 20 to 45 per cent. In practical mining operations it is necessary oftentimes to take the good and the bad together and the run of the mine is about 31 per cent in metallic iron. The ore sent to Westphalia will run somewhat higher than this, as it is not profitable to pay freight on lean ore.

The composition also varies as we go from north to south or from east to west. In German territory much of the ore carries 20 per cent of lime, which is more than is needed in the blast furnace, while in French territory silica predominates and may be as high as 25 per cent. To offset this the French ore generally runs from 3 to 6 per cent higher in iron. It is possible to make a self-fluxing mixture by using a proper combination of calcareous and silicious ores, but a large proportion of the silicious ore is not considered of commercial importance today. The estimates of the quantity in sight differ widely, but we may say in round numbers there are now known and available the following tonnages:

French Lorraine, mostly silicious ore	3,000,000,000 tons
German Lorraine, mostly calcareous ores	1,500,000,000 tons
Total	4,500,000,000 tons

Assuming that we make one ton of pig iron from three tons of ore this is the equivalent of 1,500,000,000 tons of pig iron. We have shown that in 1910 there was produced in Germany, France and Belgium 14,372,000 tons of pig iron, and at this rate the ore would last just about one hundred years. The last few years have increased rather than diminished the amount of good ore in sight, while in addition there are large reserves of inferior silicious ores. Not long ago it was generally agreed that Germany had the cream of the deposit, for her ores are calcareous and it is easy to make a self fluxing mixture; but recently either through patriotism or from more accurate information, the French have convinced themselves that they have the better of the bargain, the higher content of iron in the ore on their side of the frontier being an important advantage.

Railroads May Not Charge for "Spotting" Cars

WASHINGTON, D. C., July 13, 1915.—The Interstate Commerce Commission has decided that the railroads cannot make a special charge for so-called "car spotting," a service which involves the placing of cars on sidings or private tracks of industrial plants. The decision is of great importance to all manufacturing industries as well as to the railroads, as the allowance of spotting charges would result in a heavy increase in rates on carload shipments with commensurate increased revenue for the carriers.

The question involved in this case was raised by the railroads in Central Freight Association and Trunk Line territory, which filed tariffs with the commission making a charge of 5½c. per ton, with a minimum of $2 per car, for the placing of empties at particular spots or sidings of plant tracks and for the moving of loaded cars from such tracks. Following protests against these charges the tariffs were suspended and an elaborate investigation undertaken. The commission finds that the spotting charge would apply in many cases to services covered by the line-haul, where it includes delivery of the car to an unloading point, and further that to impose the additional charge upon the industries named in the proposed tariffs and not upon other industries for which like services are performed would result in unjust discrimination.

"However," the opinion concludes, "the line-haul rate covers only one placement of a car upon an industry track for loading or unloading, and an additional charge should be made for each additional placement of a car for that purpose, as also for the movement of cars from place to place within the plant during the processes of manufacture." Commissioner Harlan dissents from the majority opinion and will file a statement of his views hereafter. W. L. C.

Great activity is being shown in Japan's shipyards, forty-three ships now being constructed while many are still being negotiated. Builders are reluctant to accept orders, anticipating a scarcity of materials.

Regulation of Missouri Foundries

The law enacted by the Missouri Legislature in 1913 to promote healthful working conditions in foundries employing ten or more men was amended at the session of the Legislature which recently adjourned, so as to provide that all gangways in such foundries "shall be not less than 8 ft. wide, shall be kept dry and free from any and all obstructions during all times when employees are working therein; all such gangways shall have dirt floors and shall be under watertight roof; all water tanks shall be so placed that the top thereof shall be not less than 30 in. above the level of the floor, shall be kept clear of any gangways, and shall have an outlet near the top thereof, which outlet shall be connected with a sewer or other receptacle sufficient to prevent the overflow of such tank upon the floor of such establishment, and every corporation, company, or person engaged in operating any such foundry shall provide and maintain adequate and efficient devices for carrying off all poisons or injurious fumes, gases and dust from such foundry."

Chinese Forgings for England

The possibility of the exportation of Chinese forgings to Great Britain is indicated in the following from a communication from N. Adair, of the North China Engineering Works, Tientsin, China, to L. H. Pomeroy of Vauxhall Motors, Ltd., Luton, England:

> Having understood that steel forgings are being required for automobile works, I believe it would be to the advantage of manufacturers to have forgings, such as crankshafts, made in China. We have excellent blacksmiths here who can forge almost anything up to 300 lb. in a very thorough manner, and produce a forging at about 40 per cent less cost than the European blacksmiths. If you will put us in touch with any British firm requiring such forgings, and as they no doubt have to be made from special steel, which perhaps would require special treatment, they, if they communicate with us, might send us steel bars enough to make about three forgings (weight from 20 to 100 lb.), with drawings of forgings required. We would forge these bars, rough machine them, and send them home free of cost, and quote prices for doing the work. We have very good workshops here, with native blacksmiths, machinemen and fitters who really turn out first-class work.

Germany's Steel Output

Germany's steel production in April, according to official data in *Stahl und Eisen*, was 1,012,334 metric tons, against 1,098,311 tons in March of this year and 1,488,523 in April, 1914. The daily production was 42,181 tons, against 40,678 tons in March and 21,801 tons in August, 1914, the first month of the war. The April output was made up of 538,139 tons of Bessemer ingots, 415,537 tons of open-hearth ingots, 43,983 tons of steel castings, 7793 tons of crucible steel, and 6882 tons of electric steel. The total output to May 1, 1915, was 4,020,588 tons, as compared with 6,232,329 tons to May 1, 1914, a decrease of 35.7 per cent.

J. E. Annis, president of the Chattanooga Roofing & Foundry Company, is participating in a plan which is being worked out by the Tennessee Manufacturers' Association and the University of Tennessee at Knoxville for the establishment of university extension courses in a number of manufacturing plants. The plan is to organize classes of men working in the various plants and to have members of the university faculty deliver lectures. Commercial moving picture films will also be provided by the university.

Flint & Chester, Inc., 237 Lafayette Street, New York, has been appointed sales agent in the Metropolitan District, covering railroads, contractors and other buyers of jacks, for A. O. Norton, Inc., of Boston.

According to the report of the Pennsylvania Railroad Company July 2 55,995 freight cars of all classes were out of service, in comparison with 78,245 cars idle April 1, a decrease of 22,252 cars, or 28½ per cent.

June Orders for Cars Largest This Year

The total of cars ordered in June was 27,964, including the Russian orders for about 17,000. The May total was 20,210, and the monthly average for the first four months was only about 3000. The total for the first half of 1915 was 60,016 cars, against 66,000 for the first half of 1914 and 114,000 for the first half of 1913. In all of 1914 orders were given for but 80,000 cars. The orders for May and June, over 48,000 cars, are more than half the total for the preceding sixteen months, January, 1914, to April, 1915, inclusive.

Out of 936 locomotives ordered to July 1, 1915, Russia took 400. The total of foreign orders is 558, or nearly 60 per cent of the whole. Export orders already this year exceed the average for the past three years. There were 269 in 1914, 491 in 1913, and 503 in 1912.

Ore Shipments to Lake Erie Ports

Ore shipments from Lake Erie docks to blast furnaces in June were 3,794,826 gross tons as compared with 3,096,705 tons in June, 1914, and although receipts during the past month were more than 500,000 tons greater than in June, 1914, stocks at Lake Erie docks were slightly lower July 1 than on the same date a year ago. Out of a total of 6,005,091 tons shipped from Lake Superior mines in June, 4,888,450 tons came to Lake Erie ports, the receipts by ports being as follows in gross tons:

Buffalo	646,675
Erie	42,075
Conneaut	1,386,048
Ashtabula	946,437
Fairport	263,842
Cleveland	859,393
Lorain	580,070
Toledo	67,125
Huron	96,785
Total	4,888,450

German Steel Shipments Decreasing

The shipments of the German Steel Works Union in April and May were 306,115 and 288,566 metric tons respectively, which are both less than March, 351,560 tons, showing the possible effect of the British embargo and other conditions. March was the best month of the war. The distribution in March, April and May was as follows in metric tons:

	Semi-finished steel	Railroad material	Shapes
March	86,865	160,435	104,260
April	80,143	132,210	93,762
May	62,002	142,207	84,357

The May shipments were 264,306 tons less than those of May, 1914. The total for the five months to June 1 of this year was 1,468,162 tons, against 2,563,961 tons in the same period in 1914.

The Pennsylvania State College will conduct a summer school of scientific management in the two weeks beginning Aug. 9. This session is planned for the accommodation of works managers, superintendents, heads of cost, stores, purchasing, planning and production departments and members of such departments. The mornings will be devoted to lectures and discussions on industrial organization and scientific management under the leadership of Prof. Hugo Diemer, head of the department of industrial engineering at the Pennsylvania State College. In the afternoon there will be actual practice in applied methods of scientific management, in the making of time studies, tool lists, instruction cards, routing and scheduling under the direction of W. H. Tabor, formerly of the Tabor Mfg. Company, Philadelphia.

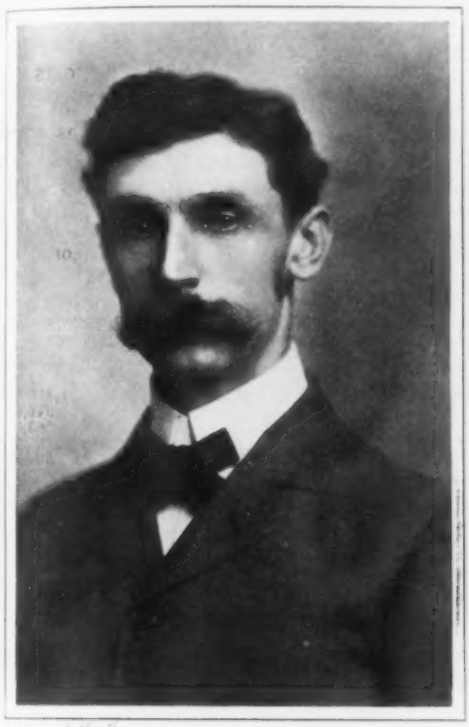
Contract has been awarded by the Treasury Department to the Guarantee Construction Company, 90 West Street, New York, for a coal and ash handling and storage system for the Government Hospital for the Insane at Washington, D. C. The equipment consists of two coal storage bunkers, coal-handling machinery, and pneumatic ash-handling system.

OBITUARY

Joseph A. Holmes

Joseph Austin Holmes, director of the Bureau of Mines, Department of the Interior, died July 13 at his home in Denver, Col. He contracted tuberculosis some time ago, and removed with his family to Colorado in the hope that the mountain air might prolong his life. He leaves his widow and four children.

Dr. Holmes was regarded by his associates in the government service at Washington as the father of the



JOSEPH A. HOLMES

Bureau of Mines, which, by a campaign of education and experiment, has largely reduced the death rate among underground workers. He took "safety first" for the watchword of the bureau's work, and it spread to all lines of industrial activity. Yet it is the judgment of his associates that he was a victim of overwork and that his continual insistence on going where only trained rescue crews should go seriously affected his health.

Dr. Holmes was born in South Carolina fifty-five years ago. He was educated at Cornell University, and later became professor of geology and natural history at the University of North Carolina. While he was a member of the faculty, in 1891, he was appointed State Geologist and he held this post, in addition to his professional duties, until 1904. In that year he was appointed by President Roosevelt to take charge of the United States Geological Survey laboratories, which are maintained at St. Louis and Pittsburgh for the testing of fuels and structural materials. Later he was made chief of the technological branch of the Geological Survey in charge of the investigation of mine accidents. When the new Bureau of Mines was created by Congress in 1910, President Taft placed him at the head of it. Under his direction much headway was made in perfecting means for saving life in mine accidents and lessening the dangers to which workers underground were exposed. He organized the first national mine safety demonstration, which was held in Pittsburgh in 1911. He planned the establishment of the three State mine rescue stations in Illinois and the twelve government rescue stations in the important coal fields of the country.

Before he became director of the Bureau of Mines Dr. Holmes had visited mining districts and examined iron, copper and other metal mines, coal mines and quarries and plants connected with the treatment and preparation of mineral products in many parts of the United States as well as in Germany, France, Belgium and Great Britain. The investigations in these lines were with special reference to lessening the loss of life and the waste of resources.

Dr. Holmes received the degree of D.Sc. from the University of Pittsburgh and that of LL.D. from the University of North Carolina. He was a member of the Mining Legislation Commission of Illinois, National Conservation Commission, American Institute of Mining Engineers, American Society for Testing Materials, the Academies of Science of St. Louis and North Carolina, American Society of Mechanical Engineers, the Cosmos Club of Washington, the Engineers' Club of New York, and was a fellow of the Geological Society of America.

R. C. SCOTT, secretary-treasurer of the Morris Machine Works, Baldwinsville, N. Y., died suddenly July 4 as he prepared to drive off in the final match of a senior championship golf tournament on the course of the Onondaga Golf and Country Club. The excitement is thought to have induced heart trouble. He was 66 years of age.

JAMES A. COLVIN, president Standard Metal Works, Thompsonville, Conn., and engaged in the plow, stove and other foundry business since 1863, died July 4 at Enfield, Conn., aged 82 years.

CHARLES H. WEEKS, for forty years vice-president and sales manager of the Buckeye Engine Company, Salem, Ohio, died July 9, aged seventy-one years.

JAMES W. WEAVER, secretary and treasurer of the Thomas Iron Company and vice-president of the Easton School Board, died July 8 at Easton, Pa.

San Francisco Wants More Merchant Ships

A campaign to put more American ships upon the seas and change the maritime laws of the United States so that American ship owners can compete with foreign vessels in the race for new markets has been launched by the San Francisco Chamber of Commerce. Resolutions setting forth these ideas have been adopted and sent to President Wilson and to 400 of the leading commercial organizations of the country. It is proposed to arouse a public demand for "the establishment of regular mail and freight lines under the American flag to countries in which the commercial interests of the United States are important, and to American dependencies."

The President is urged to appoint a commission of shipping men to draw up a bill modeled on the laws of the great maritime nations, this bill to repeal all conflicting regulation. The point is made that the regulations of the United States should not be more burdensome on the operators of vessels under the American flag than other powers impose upon their steamship men. The commission, it is suggested, should give a hearing to all opposing interests. It is planned to educate the people and to bring pressure upon Congress through the various commercial bodies.

The Governor of Pennsylvania has named three attorneys, James W. Leech, Ebensburg; John A. Scott, Indiana, and Harry A. Mackey, Philadelphia, to be the members of Pennsylvania's first Workmen's Compensation Board, which will have charge of the compensation system provided by the last Legislature. The compensation act will not become effective before Jan. 1, 1916.

Four additional open-hearth furnaces at the Saucon plant of the Bethlehem Steel Company were put in operation last week, making twelve now active. The Grey structural mill has been put on double turn, owing to an increase in new orders and specifications for structural shapes.

PERSONAL

Roy C. McKenna of McKenna Bros. Brass Company, Pittsburgh, has been elected president of the Vanadium-Alloys Steel Company, Pittsburgh. He succeeds E. T. Edwards, who resigned to become president of the Latrobe Electric Steel Company, Latrobe, Pa., but is still a director. Mr. McKenna brings to his new position the experience gained in the years he has been the head of the mechanical department of McKenna Bros. Brass Company. He graduated from the University of Pittsburgh in 1903 in electrical and mechanical engineering. His family has been identified with the high-speed steel trade since 1902.

ROY C. M'KENNA

Joachim G. Giader, who has been chief engineer of structural design and foundations for D. H. Burnham & Co. for the past seventeen years, has opened offices as a consulting engineer at 751 Railway Exchange Building, Chicago. He will specialize in structural design, foundations and building engineering in general. The new forty-story Equitable Life Building is the latest example of Mr. Giader's designing.

B. B. Truett, Hallidie Machinery Company, chairman, L. R. Gross, Spokane Ornamental Iron & Steel Works, vice-chairman, and Stanley Mayall, Armstrong Machinery Company, secretary and treasurer, are the officers elected at a recent meeting of the Inland Empire District of the United Metal Trades Association of the Pacific Coast. All are of Spokane, the Inland Empire district covering the metal trades of that city.

Lawrence H. Underwood, who has been assistant superintendent of the by-product coke plant of the Indiana Steel Company, at Gary, Ind., has been appointed superintendent of the by-product coke plant of the Youngstown Sheet & Tube Company, which is now under construction at Youngstown, Ohio. He will take up his new duties Aug. 1.

Dr. Rukard Hurd has resigned as secretary of the Minnesota Tax Commission and the commission has made him director of its Department of Mines and Mineral Taxation, creating this office for the department of which he has had charge since 1907. The work has grown to such an extent that the commission desired to relieve Dr. Hurd of the daily routine of the secretaryship. Dr. Hurd has long held a high place of authority in iron ore valuation and taxation, and his "Iron Ore Manual" is a standard work on those subjects.

L. M. Schlechter, chief engineer and commercial manager of the Russian Locomotive & Engine Corporation, Kharkoff, Russia, is in this country with a view to placing large orders for heavy machinery. He has also been visiting the large locomotive works here.

F. H. Heath, heretofore of the Boston office of the Jones & Laughlin Steel Company, has been appointed district sales manager for the company at Detroit, succeeding F. H. Holt, who has resigned.

Paul B. Oatman has been made manager of the small tools department of the Modern Tool Company, Erie, Pa. He was formerly manager of the Ideal Die & Tool Company, Beaver Falls, Pa.

J. F. Crawford, master mechanic in charge of design in the automobile department of the J. I. Case Threshing Machine Company, Racine, Wis., has resigned to become motor designer for the Curtiss Aeroplane Company, Hammondsport, N. Y.

J. C. Wallace, a civil engineer on the staff of the Falk Company, Milwaukee, for three years, and W. F. Lynbaugh, engineer of tests in the West Milwaukee shops of the Chicago, Milwaukee & St. Paul Railway Company since 1913, have been appointed United States civil engineers and resigned their positions July 1 to enter the federal engineering service. Mr. Wallace is a graduate of Pennsylvania State College, and Mr. Lynbaugh of Cornell University.

Frederick G. Wacker, president of the Bauroth Machine & Tool Company, which is to be consolidated with the Webster & Perks Tool Company, Springfield, Ohio, will remain in Toledo as manager of the Toledo Steel Barrel Company.

J. K. Pollock, representing Rogers, Brown & Co., Cincinnati, visited San Francisco about the end of June.

E. E. Yake, assistant to the superintendent of blast furnaces at the Steelton, Pa., plant of the Pennsylvania Steel Company, has resigned to become superintendent of the Ames Plow Company's plant at Framingham, Mass. Mr. Yake was instructor in the State College extension school at Steelton, which position also he has resigned.

Albert Russell Erskine, who was elected president of the Studebaker Corporation last week, became treasurer of the company in 1911 and has been first vice-president and treasurer since 1913. In 1904 to 1910 he was treasurer and member of the executive committee of the Yale & Towne Mfg. Company and in 1910 and 1911 was vice-president of the Underwood Typewriter Company.

Harold B. Gaylord has been appointed district sales agent of the Carpenter Steel Company for Boston and eastern New England, vice James W. Sederquist, who has been transferred. Mr. Gaylord will be assisted by William T. Dunn, the company's present tool steel expert in the above territory. The Boston office is at 131 State Street.

J. F. McNamara has been appointed general manager of the Bayonne Steel Casting Company, Bayonne, N. J., to succeed W. E. Oakley. The change became effective July 1 at which time there was a complete reorganization of both the office and foundry management of the company.

Lee B. Morris, district sales manager of the Cambria Steel Company, at 165 Broadway, New York, has returned to his office after a few weeks' illness.

S. J. Marshall has resigned as secretary and director of the Globe Malleable Iron & Steel Company, Syracuse, N. Y., and has organized the Endicott Forging & Mfg. Company of Endicott, N. Y. The company has acquired the L. S. White Forging Company at that place.

Arthur K. Ingraham, who is 78 years old, and for forty-five years has been a salesman in the employ of the Joseph Dixon Crucible Company, Jersey City, N. J., is claimed to be the oldest traveling salesman in this country.

Waldo H. Marshall, president American Locomotive Company, has been elected first vice-president of the Merchants' Association of New York.

Hugh Kennedy, vice-president and general manager of the Rogers-Brown Iron Company, Buffalo, has almost entirely recovered from the injuries he received by being accidentally thrown from a larry the latter part of April while showing a party of visitors through the company's plant. He has resumed his regular duties, being at his office a portion of every day.

R. Bowen has been appointed sales manager of the Kennedy-Stroh Corporation, with executive offices in Pittsburgh and plant at Oakmont, Pa. Mr. Bowen was formerly general manager of the Epping-Carpenter Pump Company, Pittsburgh, and prior to that was with the International Steam Pump Company for about 15 years.

H. Gossen has been placed in charge of the New York office, at 165 Broadway, of the American Steel Export Company, the new corporation to take care of the foreign business of the Cambria Steel Company.

Oliver Phelps, after a long connection with the pig-iron trade at Detroit and with manufacturing operations in foundry and car building lines, has opened an office at 1516 Ford Building for the purpose of acting as manufacturers' agent in that city and vicinity. One agency of which announcement is made is that of the Dayton Malleable Iron Company, Dayton, Ohio.

W. T. Partridge, who has ably conducted the iron and steel and metal market department of the *Journal of Commerce*, New York, for the past twelve years, has severed his connection with that paper.

Celebration of W. L. Brown's 50 Years in the Iron Trade

Fifty years of constructive service in the iron business are the accomplishment and privilege of but few. Such a career, when marked by eminent success and permanent monuments in the form of established enterprises of magnitude, makes for a peculiar eminence. On July 10, W. L. Brown, president of Pickands, Brown & Co., celebrated the fiftieth anniversary of his entrance into the iron business. Few men have played so important a part in its development from small beginnings. At the age of 73 Mr. Brown is still the active executive and a man of large interests to which his personal attention is given. Upon such an occasion congratulations from the associates of years in the iron and steel business are most happily bestowed. Mr. Brown's anniversary was marked by the gift of an appropriate silver loving cup from the employees of Pickands, Brown & Co., a clock from the Federal Furnace Company organization, and a similarly beautiful remembrance from Pickands, Mather & Co. Equally prized was the flood of congratulatory messages received from those who have been associated in the various enterprises to which Mr. Brown's exceptional organizing ability has been devoted. As a bookkeeper with the then prominent firm of A. D. Meeker & Co., Chicago, Mr. Brown inaugurated his work in the iron business, subsequently acquiring an interest in that organization. Always an executive by natural gift and inclination, he took part in the organization of Pickands, Brown & Co., in September, 1883. In addition to the work of building up this company, Mr. Brown's interests branched out in many other directions. He became chairman of the finance committee and the executive board of the Illinois Steel Company, in which capacity he continued until the organization of the United States Steel Corporation. He was second president of the Chicago Shipbuilding Company and his subsequent conduct of the American Shipbuilding Company as chairman of the board is well known. He is still a chairman of the First National Bank of Chicago. None has been a more important factor nor a more admirable personality in the development of the iron business of the Middle West, nor in the wider circles of the iron business of the country as a whole is there a more modest and yet more commanding figure. In his hope of a long period of active effort still to come the entire iron and steel trade sincerely join.

Pittsburgh and Nearby Districts

The Carnegie Steel Company, Pittsburgh, has placed the skelp mill at the Farrell, Pa., plant in full operation. The second blast furnace at the Isabella plant has been blown in, making two in operation there, and a total of 46 out of 59 furnaces of the Carnegie Company in blast.

The Youngstown Iron & Steel Company, Youngstown, Ohio, made a record in June with an output of 6027 tons of special sheets for stamping purposes. The company will probably start its open-hearth steel plant at Lowellville, Ohio, four miles east of its sheet mills at Haselton, this month.

The Buckeye Engine Company, Salem, Ohio, has taken contracts for the construction of ten cross-compound engines. Five were ordered by the Connersville (Ind.) Blower Company, and will be used in the construction of the blowing equipment for the new by-product coke plant of the Youngstown Sheet & Tube Company. Five will be used in the by-product coke plant now under construction at Toledo, Ohio.

The H. K. Porter Company, Pittsburgh, is reported as being very busy with foreign orders for light locomotives. It is building 33 for the Russian Government, 22 being of 72 tons each and 11 of 67 tons each. It is stated also that the company is completing an order for 33 light locomotives for Cuba, and that orders for different types of small engines are coming in freely from the Governments of the Argentine, Brazil, and China. Business at present is stated to be enough to keep the plant in full operation for a year.

New Dwight & Lloyd Sintering Plant

The American Ore Reclamation Company, 71 Broadway, New York, is building a Dwight & Lloyd iron ore sintering plant for the Toledo Furnace Company, Toledo, Ohio. It will consist of two machines having a capacity of 300 tons a day each. The fuel will be blast furnace gas, the company having perfected a method of producing an effective flame with such gas through 3/16-in. orifices. The plant will treat flue dust, of which there is a large accumulation at Toledo. Sintering operations will begin in September. The Dwight & Lloyd plant at Birdsboro, Pa., operated by the E. & G. Brooke Iron Company, has been remodeled and this work, together with the installation of larger fans, has brought the capacity up to 200 tons of sintered ore a day. The material treated is crushed ore from the company's French Creek mine. Blast furnace gas will be burned for the sintering. The development of the Dwight & Lloyd process in the past year, chiefly by the increase of blower capacity, has increased materially the output of all plants of this type.

New Holdings in Cleveland Furnace Company

Rogers, Brown & Co., have sold their interest in the Cleveland Furnace Company, Cleveland, Ohio, comprising a large block of stock, to William G. Mather and several associates. Mr. Mather has succeeded D. B. Meacham of Rogers, Brown & Co., as vice-president, and two of the new owners, J. H. Sheadle and H. A. Raymond, have become directors of the Cleveland Furnace Company. Rogers, Brown & Co. will continue to sell the company's pig iron. The Cleveland Furnace Company's plant includes two blast furnaces and by-product coke ovens.

Indian Exports of Manganese Ore Low in April

The exports of manganese ore from India in April were 16,269 gross tons, of which 12,969 tons went to Great Britain and 3300 tons to France. In April, 1914, the exports were 65,533 tons, making the decrease this year 49,264 tons, or 75.8 per cent. Since Jan. 1 no ore has been sent from India to this country.

Machinery Markets and News of the Works

MORE SHOP CONSTRUCTION

Manufacturing Operations Spreading Out

Willys-Overland Company a Heavy Buyer — Seaboard Air Line Issues Big List— War Is Basis of Demand

Activity is more general in all of the machinery markets, and interesting features are to be found in every direction. Projected new plants, extensions to old ones, and the taking over of established factories continue to denote prosperity, a very large part of which is based on war business.

The Seaboard Air Line has taken bids on a large list of machine tools and other railroads have been purchasers. Within the past ten days the Willys-Overland Company has purchased $250,000 worth of tools.

In New York a large number of machines for war purposes continue to be sought. In this territory the Watson-Stillman Company, maker of hydraulic machinery, is building an addition, 60 x 100 ft., to its plant. The Fleetwood Metal Body Works, Fleetwood, Pa., is taking bids for the construction of three factory buildings. An extension is being erected for the John A. Roebling's Sons Company, Trenton, N. J.

The Consolidated Press & Tool Company, Hastings, Mich., will erect a machine shop 150 x 400 ft. The R. B. Phillips Mfg. Company has been formed in Boston to take over the Worcester plants of the Critchley Machine Screw Company and the Reed & Curtis Machine Screw Company. The Union Twist Drill Company, Athol, Mass., has purchased the machinery of the National Printing & Machinery Company, Athol. The Winchester Repeating Arms Company, New Haven, will erect a four-story factory building, 54 x 441 ft., to cost $314,000. The Webster & Perks Tool Company, Springfield, Ohio, will take over the Bauroth Machine & Tool Company, Toledo.

In Chicago there has been some abatement of the demand for machine tools to make munitions of war, but general business is increasing. The buying of lathes by the Burlington Railroad was curtailed by the high prices now asked for machine tools. In the Middle West the increase of production facilities is as notable as it is in the East. In the Central South woodworking machines are in demand for the manufacture of gunstocks and aeroplane parts.

Indianapolis plants of all descriptions are busier, while in Milwaukee many of the machine tool builders have sold their output into 1916 and there is conjecture as to what will be done when domestic demand becomes normal.

High speed tool steel agents in Cincinnati report an unprecedented demand. In that city radial drilling machines are in better demand, and standard sizes have been almost wiped out.

The Sterling Engine Company, Buffalo, is shipping high-powered gasoline motors to London for use on armored patrol launches which have been designed to act as submarine destroyers. The company has a similar contract with the Italian Government.

The Quebec Development Company, Ltd., 200 Fifth Avenue, New York, is in the market for twelve units of hydraulic and electrical apparatus of 35,000 h.p. each for its Isle Maligne power plant development on the Saguenay River.

New York

NEW YORK, July 14, 1915.

The Seaboard Air Line has taken bids on a list of railroad shop equipment comprising about 75 machines for delivery f.o.b. Portsmouth. Many months ago the Seaboard issued a list on which definite action was never taken. When its machine shops at Portsmouth were destroyed by fire recently it bought a number of tools for replacement, but the original requirement still existed and the present list is to provide for the shop extension planned months ago. The new list is very complete. The machine tool trade believes that the condition of deliveries will make it exceedingly difficult to get some of the machines desired. Others will be obtainable easily enough.

The Pennsylvania Railroad has bought four automatic screw machines for delivery to Altoona, and the New York, Ontario and Western Railroad is inquiring for one 2¼-in. turret lathe.

The war demand for machine tools is most active and continues to dominate the market. Stone & Webster, engineers, 5 Nassau Street, New York, are inquiring for 100 large turret lathes. A number of the same type of machines are also being sought by the Westinghouse Air Brake Company.

J. P. Morgan & Co., representing England, are endeavoring to place an order for large shells. It is reported that the Baldwin Locomotive Works has an order for a large number of 4.7-in. high explosive shells.

So great is the scarcity of certain types of machines used in shell making that one large company having war contracts has sought to make an arrangement with a machine tool builder whereby the latter's drawings could be utilized in shops which the company would select. Good machines are essential for a large part of the operations in manufacturing war munitions. Already a case has come to light where a contract was cancelled because a plant using old machines could not make a product which conformed to specifications. In this case the limit allowed was plus or minus 0.0005 in.

The Watson-Stillman Company, Aldene, N. J., will begin work at once on an addition to its plant, 60 x 100 ft., containing two galleries, each 30 x 60 ft. It will be used as an erecting shop and is to be completed by September 1. No new equipment will be required. The company has just booked an order from England for a large metal extruding press, with all hydraulic equipment. Presses of this kind have heretofore been bought in Germany by English manufacturers. The Watson-Stillman Company are now building two for domestic delivery.

The Quebec Development Company, Ltd., 200 Fifth Avenue, New York, will receive proposals until Aug. 2 for furnishing twelve units of hydraulic and electrical apparatus of 35,000 hp. each for its Isle Maligne power plant on the Saguenay River, which will be devoted to electro-chemical processes. Future development calls for another similar plant; but nothing will be done regarding this for the present. W. S. Lee is chief engineer.

The W. A. Ives Mfg. Company, Wallingford, Conn., is in the market for a heading, upsetting and forging machine.

Frank H. Falls, 336 State Street, Rochester, manufacturer of heating apparatus and plumbers' materials, has let contract for the erection of a factory on Mills Street, 50 x 100 ft.

The United States Light & Heat Corporation, Niagara Falls, N. Y., has been incorporated with a capitalization of $7,000,000 to manufacture machinery, batteries and appa-

tus for the production of electric light, heat, etc. It is reorganization of the United States Light & Heat Company, and will take over and continue the operation of that company's extensive manufacturing plant on Highland Avenue, Niagara Falls, N. Y. G. M. Walker, A. L. Fowle and A. S. Jones, 60 Broadway, New York City, are the directors.

The Kellogg Mfg. Company, 3 Circle Street, Rochester, N. Y., manufacturer of air pumps, etc., has completed plans for an addition to its plant.

At a recent meeting of the directors of the Kentucky Solvay Coke Company, Syracuse, N. Y., it was decided to increase the number of ovens at the company's plant at Clyffside Park, Ashland, Ky., from 52 to 104 and to increase the capacity of the remainder of the plant to correspond.

The Schoellkopf Hartford & Hanna Company, Buffalo, N. Y., has changed its name to the Schoellkopf Aniline & Chemical Works, Inc. Extensive additions to the plant at Abbott Road, Lake Shore Railroad and the Buffalo River are planned.

The C. A. Durr Packing Company, Utica, N. Y., has plans in preparation for a brick addition to its plant on Schuyler Street.

The National Limousine Top Corporation, Buffalo, has leased factory premises at 41 Letchworth Street, and is equipping it for the manufacture of automobile tops, etc.

The Linde Air Products Company, Forty-second Street Building, New York, will build a one-story brick factory, 76 x 100 ft., on Driggs Avenue, near North Tenth Street, Brooklyn, at a cost of $15,000.

The Turner Construction Company, 11 Broadway, New York, has received contract for the erection of a three-story factory for the Becker's Aniline & Chemical Works, East Eighty-third Street and Ditmars Avenue, Brooklyn. It will be 60 x 200 ft., and cost about $40,000.

The Newark Mat Company has been incorporated with a capital stock of $15,000 to take over an existing plant for the manufacture of a combination rubber and metal mat. C. B. Jordan, 11 Broadway, New York, is president; C. R. Dollman, vice-president, and S. A. Williams, secretary and treasurer.

The American Piano Hammer Company, Dolgeville, N. Y., has been incorporated with a capital stock of $10,000 by Nathan, L. J., and E. M. Snell, who are directors of the company. It will start at once on the manufacture of piano hammers. A factory has been secured on State Street and is being equipped with special machinery manufactured by William Menge, Sr., at Dolgeville.

J. M. Huber, manufacturer of colors and inks, 65 West Houston Street, New York, will build an addition to his plant at 600 Sixty-second Street, Brooklyn, 25 x 64 ft., for the manufacture of special chemicals and inks formerly imported from Europe.

The Turner Construction Company, 11 Broadway, New York, has been awarded contract for a reinforced concrete factory for the Vacuum Oil Company, Rochester, N. Y. The building will be three stories and basement, 95 x 217 ft.

The Electric City Novelty & Mfg. Company, Schenectady, N. Y., has increased its capital stock from $6,000 to $11,000 to provide for the manufacture of special washers and copper gaskets for automobiles. F. Weinburg is manager.

Totowa, N. J., will receive bids until July 19 for the construction of a waterworks.

The Driver-Harris Wire Company, Railroad Avenue and Fourth Street, Harrison, N. J., is seeking cold rolling mills, 16, 12, 15 and 18 in. in diameter. Thomas Bagnall, Box 206, Newark, N. J., the purchasing agent, should be addressed.

Wenonah, N. J., has voted $8,000 of water plant bonds. George C. Grosscup is clerk.

Baltimore

BALTIMORE, MD., July 12, 1915.

The Monitor Controller Company, 111 South Gay Street, Baltimore, has increased its capital stock from $5,000 to $40,000.

The Central Automobile Company, Baltimore, has been incorporated by A. Herman Siskind, Law Building, Baltimore, Hyman D. Caplan and Harry Israelson, with capital stock of $10,000.

The New York & Hagerstown Metal Stamping Company, Pope Avenue, Hagerstown, Md., which recently took over the plant of the Montrose Metal Casket Company, is preparing to fill war orders.

The Yingling Automobile & Carriage Company, Hagerstown, Md., has been incorporated with a capital stock of $25,000 by Harry L. Yingling, 9 East Lee Street, Hagerstown, Conrad Hausrath and Robert H. McCauley. It will manufacture, repair, deal in, etc., automobiles and carriages.

The machinery firm of Cooke, von Schilling & Gentis, Newport News, Va., has been incorporated with a capital stock of $25,000 by Franz von Schilling, president, Hampton, Va.; E. L. Gentis, vice-president, and W. L. Cooke, secretary-treasurer.

A cannery with a daily capacity of 1500 to 2000 cans is planned by T. C. Barlow, Pennington Gap, Va. Prices on machinery are being sought.

The plant of the Virginia Lumber & Box Company, Petersburg, Va., was destroyed by fire July 6 with a loss of about $100,000.

Contract for the erection of a six-story addition, 41 x 143 ft., to the cold-storage plant of the Terminal Freezing & Heating Company, 412 and 414 South Eutaw Street, Baltimore, has been awarded to the Consolidated Engineering Company, Calvert Building, Baltimore. The addition will cost about $20,000.

The B. & B. Company, West Point, Va., has started the construction of frame factory buildings, two stories, 60 x 160 ft. and 50 x 150 ft. for the manufacture of furniture. H. L. Baldwin is in charge.

New England

BOSTON, MASS., July 12, 1915.

The feature of the week in metal-working lines is the purchase by the R. B. Phillips Mfg. Company, Boston, of the plants of the Critchley Machine Screw Company and the Reed & Curtis Machine Screw Company at Worcester, and the Paterson Rubber Company at Lowell. The new company has been recently incorporated with a capital stock of $600,000 by R. B. Phillips, treasurer of the American Steam Gauge & Valve Company, 208 Camden Street, Boston. It is understood that Mr. Phillips has secured English contracts for shrapnel and fuse timers amounting to $2,500,000. The Worcester plants were owned by James V. Critchley, who has been operating them day and night; and the sale includes contracts on which they have been operating. The new management has already taken over the plants, and contractors have started to double the size of the Critchley plant by the addition of two stories, to be completed and equipped for operations about Oct. 1. It is said that $300,000 worth of automatic screw machinery has been ordered in Cleveland to bring the equipment up to requirements. The present business of these two plants, which is estimated to be worth $500,000 annually, will not be interrupted by building operations. Mr. Critchley, who retains the name of the Critchley Machine Screw Company, has no plans for continuing in business; and it is said he has been asked to act as a director of the new company.

A building permit has been issued the Norton Company, manufacturer of grinding machinery, Worcester, Mass., for the construction of a manufacturing building to be erected on West Boylston Street at a cost of about $100,000. The E. J. Cross Company is the contractor.

The Whitcomb-Blaisdell Machine Tool Company, manufacturer of lathes and planing machines, Worcester, Mass., has taken out a permit for the construction of a foundry on Southgate Street at a cost of about $4,500.

The Bridgeport Brass Company, Bridgeport, Conn., has filed plans for two warehouses, 70 x 98 ft., and 24 x 43 ft., to be erected on Pembroke Street.

The Bridgeport Piston Ring Company, Bridgeport, Conn., will erect an addition to its plant on Connecticut Avenue and Third Street. It will be one story, 32 x 74 ft.

The Max Ams Company, Washington Street, Mount Vernon, N. Y., manufacturer of sheet metal working machinery, has about completed the construction of its additional plant at Fairfield, on the outskirts of Bridgeport, Conn., and will shortly begin operations with a force of about 400 mechanics.

The Bridgeport Steel Construction Company, 307 Meigs Building, Bridgeport, Conn., has been incorporated with a capital stock of $15,000 by Henry B. Saltman, Samuel S. Crise and F. William Bauer of Bridgeport. Mr. Crise was formerly a superintendent for James Stewart & Co., St. Louis, Mo., who are building the additions to the Remington Arms plant.

H. M. Peckham, who is engaged in the wood-turning business, has purchased the plant of the National Printing & Machinery Company, on Canal Street, Athol, Mass., which has sold its machinery to the Union Twist Drill Company, Athol. The new owner has disposed of his present factory to the N. D. Cass Box Company, which will use it for storage.

It is reported that the Wellington Piano Case Company, Leominster, Mass., will manufacture gunstocks for foreign

rifle orders, and that the contracts will necessitate enlargements to its factory.

The Winchester Repeating Arms Company, New Haven, Conn., is taking out a permit for the construction of a new factory on Winchester Avenue that will be one of the largest erected by the company in some time. It will be 54 x 441 ft., four stories, with basement and monitor, of reinforced concrete and steel, estimated to cost $314,000. The Aberthaw Construction Company, Boston, Mass., has been awarded the contract. L. W. Robinson, New Haven, is the architect.

The Colt's Patent Fire Arms Company, Hartford, Conn., is reported to plan the use of the former west armory as additional manufacturing quarters. This will enable the Hartford Auto Parts Company, the Sterling Blower Company, the Asa S. Cook Company and the Maxim Silencer Company, all of whom have leases of a large part of the present west wing of the Colt plant that are said to be about to expire, to remain in the building.

George Hartley, manufacturer of wire, Waterbury, Conn., has awarded contract for the construction of a one-story factory, 36 x 50 ft., to be erected at 50 Jefferson Street.

The Shepard Gourd Company, Melrose, Mass., manufacturer of jewelry, is seeking a second-hand coin or straight-side press, with coining attachment, capable of making medals the size of a quarter dollar or larger.

The Barbour Buggy Company, South Boston, Mass., will purchase a second-hand 150-hp. return tubular boiler.

Lynn, Mass., has authorized an issue of $200,000 of water supply system bonds.

Philadelphia

PHILADELPHIA, PA., July 12, 1915.

The Fleetwood Metal Body Works, Fleetwood, Pa., has had plans drawn for factory buildings, 70 x 110 ft., 40 x 299 ft., and 40 x 144 ft., all 2½ stories, of brick and steel, to cost about $40,000, and are now taking sub-bids for the construction work.

E. & R. Preisendanz, 15 Market Street, Camden, N. J., wagon manufacturers, have had plans drawn by J. C. Jefferis, 1001 Chestnut Street, Philadelphia, for a four-story factory, 96 x 100 ft., of reinforced concrete, and is now receiving estimates for the construction.

John A. Roebling's Sons Company, Trenton, N. J., is sub-letting contract for the construction of a two-story factory, 80 x 126 ft., of brick construction, to cost about $15,000.

The Fabric Leather Company, Reading, Pa., will soon start the erection of a plant for the manufacture of artificial leather. Henry A. Meers will have charge of the factory, and he, with Edward A. Auerbach, 439 Penn Street, Reading, and P. O. Reed, are the organizers.

The Waynesboro Foundry & Machine Company, Waynesboro, Pa., has been incorporated with a capital stock of $30,000. L. D. Gilbert is treasurer.

Demands for high explosives have caused the Nitrate Products Company to increase the capacity of its plant at Mount Carbon, Pa.

Plans have been drawn for a two-story office building for the Lebanon Steel Foundry, Lebanon, Pa. W. M. Worrilow is president.

Catalogs Wanted

The Villinger Mfg. Company, manufacturer of machinery, Williamsport, Pa., suffered a slight damage by fire to its transmission equipment, belting, etc., on July 5, but will resume within a few days with only a slight delay. It is operating 12½ hr. a day with a full force on domestic orders. The catalog file was destroyed and new catalogs and circulars on tools, etc., are requested to form the nucleus of a new file. W. E. Villinger is general manager.

Chicago

CHICAGO, ILL., July 10, 1915.

While there has been some abatement of the rush for machine tools to meet the needs of ammunition manufacturers, the demand for lathes is still ahead of the easily available supply. The call for second-hand machinery is likewise urgent and in this direction a heavy movement is reported. The number of manufacturers in this territory who are taking on so-called war business is increasing; but the exceptional demand for new equipment that characterized the undertaking of such contracts earlier does not come from them. Opinion generally agrees as to the scarcity of business other than that arising from war orders. It appears that the curtailed buying on the part of the Burlington railroad, which has been the only normal business of importance, was due to its determination to postpone purchases of that kind of equipment for which prices have risen so markedly. Comparatively few lathes were included in the purchases made. Deliveries from tool builders for local stocks are as long delayed as five months for some sizes of lathes, and, as a result, dealers are compelled to place orders so far in advance as to introduce a speculative element.

A. W. Holmberg is about to erect a one-story garage, 52 x 96 ft., on Crawford Avenue, Chicago, near Belden Avenue, to cost $10,000.

The Cole Motor Car Company, 2326 Indiana Avenue, Chicago, will erect a three-story service building, 50 x 161 ft., to cost $40,000.

C. L. Doering & Son, Lake and Sheldon Streets, Chicago, have had plans prepared for a two-story addition to their sheet metal working shop, to cost $30,000.

The business of the Wildman Boiler & Tank Company, 3458 Archer Avenue, Chicago, boiler manufacturer, has been incorporated with a capital of $15,000.

The Crescent Forge & Shovel Company, Havana, Ill., manufacturer of plow shares, etc., has begun the construction of a steel and concrete factory building which will increase very considerably its capacity.

The Monmouth Plow Company, Monmouth, Ill., has increased its capital stock from $150,000 to $750,000 and plans the erection of a four-story addition to its plant.

The Chicago, Burlington & Quincy Railroad Company has awarded contracts for the erection of new blacksmith shops at Galesburg, Ill., to replace those recently destroyed by fire.

The Baldwin Mfg. Company, Nickerson, Kan., manufacturer of threshing machines, has entered into a contract to occupy and operate the plant formerly controlled by the Holmes Machine Mfg. Company, Sparta, Mich.

The Standard Four Tire Company, Keokuk, Iowa, of which William J. Richards is general manager, is about to begin construction of a factory for the manufacture of tires.

Keota, Iowa, will receive bids until 2 p. m., July 20, for the construction of a waterworks system, including a deep well pump and engine. Charles P. Chase, Clinton, Iowa, is consulting engineer.

The Board of Supervisors of the Fabius River drainage district, Quincy, Ill., is receiving bids at the office of John H. Best, Quincy, for equipment for a pumping station, including two 42-in. centrifugal pumps of 46,000 gal. per min. capacity. Both oil engine and electric drive will be considered. The Harman Engineering Company, Peoria, Ill., is consulting engineer.

The Gits Electrical Company, Franklin Park, Ill., has been incorporated with a capital stock of $16,000 by A. B. Kirchoff, James O'Malley and John Early to manufacture electrical appliances.

The Galena Tile Roof & Construction Company, Galena, Ill., has been incorporated with a capital stock of $15,000 by William Stacy, James E. Furlong and Jacob F. Moffley to manufacture roofing tile, etc.

The Consolidated Press & Tool Company, Hastings, Mich., will erect a machine shop, 150 x 400 ft., to be spanned by a 50-ton crane and to be equipped largely with new machinery. The additions contemplated will increase the present capacity about 2½ times.

The Engberg Company, St. Joseph, Mich., has awarded the contract for a machine shop, 70 x 200 ft.

Milwaukee

MILWAUKEE, WIS., July 12, 1915.

Practically all of the machine tools that present facilities of Milwaukee machine-tool builders can produce from now until well into 1916 have been asked for, and this division of the metal trades industry is perhaps in the most promising condition in its history. What will be done when domestic consumers begin to ask for tools in the usual quantities becomes a live question. For many months large users of machine tools have kept their existing equipment at work, when in more prosperous times the machines would be cast aside as obsolete. The effect is beginning to be felt, and a demand made imperative by necessity for replacement has set in. The second-hand market, glutted as it was last fall, is nearly cleaned up, and the only recourse is to get new machines, which, as stated, are already difficult to get and later may be impossible to obtain. The labor situation in Milwaukee shows considerable improvement, the demand for men, especially skilled workmen, being far greater than a year ago. Founders report conditions improved, although by no means normal. Slight improvement is noted in other lines of the metal trades.

The Sanger Automobile Company, 564-574 Farwell Avenue, Milwaukee, will remodel its garage, add a second floor, and install a small lot of shop equipment. Gustav A. Dick is the architect.

The purchase by J. I. Case Threshing Machine Company, Racine, Wis., of the plant and business of the Perfection Wood Machinery Company, Galion, Ohio, is reported from Racine. No details are available with regard to the future of the Galion works or the distribution of operations under the new ownership.

A new high school costing $100,000 and embodying a complete manual training department, will be erected by the city of Watertown, Wis. Bids will be taken by the board of education about July 20. The plans were made by Parkinson & Dockendorff, LaCrosse, Wis.

The Western Storage Battery Company, Chicago, Ill., has moved its plant and offices to Portage, Wis., where local capital has taken a financial interest and made it possible to greatly increase the output of storage batteries and complete electric lighting systems for villages, farms, etc., operated by gasoline engines. The new plant at Portage is now operating under the direction of William Petschel, president and general manager. All immediate needs for equipment are filled.

Kenosha, Wis., has decided to dispose of its present municipal waterworks pumping station to the Simmons Mfg. Company, Kenosha, for $25,000 and a seven-acre site on Washington Island for its proposed new pumping station and lake intake. Final plans for the intake, pumping station, shore tunnels, etc., are being made. B. C. Brennan is superintendent.

The Sternberg Motor Truck Company, Forty-sixth Avenue and Rogers Street, West Allis, Milwaukee, has changed its corporate title to the Sterling Motor Truck Company. The company is working on large war orders for trucks and making shipments almost daily.

Indianapolis

INDIANAPOLIS, IND., July 12, 1915.

Reports from some of the Indiana manufacturing centers indicate the intense degree of stimulation certain lines have felt from the war demand. The Studebaker Corporation is still working day and night forces at its plants at South Bend, Ind., orders for automobiles and farm wagons being large. Muncie, Ind., has several factories making automobile parts, and they are all operating at capacity, some of them not able to accept all orders. Among these busy factories are the Warner Gear Company, Muncie Gear Company, and the Inter-State Motor Company. The Globe Stove & Range Company, Kokomo, Ind., is on full time again, with a force of 600 men. The Kokomo Steel & Wire Company has been running overtime on account of war orders, and domestic orders have been increasing in number and size.

The Furnas Office & Bank Fixture Company, Indianapolis, manufacturer of office equipment, has increased its capital stock $30,000.

The Automatic Gas Motor Company, Indianapolis, has been dissolved.

The Auto Equipment Company, Indianapolis, has been incorporated with $10,000 capital stock to manufacture auto equipment. The directors are H. A. Comstock, C. B. Fletcher, and C. A. Risdon.

The Insulating Products Company, Elkhart, Ind., has been incorporated with $100,000 capital stock to manufacture insulating material. P. L. Turner, A. B. Connable, and C. H. Wright are the incorporators.

The Brookville Electric Light Company, Brookville, Ind., has asked the Public Service Commission of Indiana for permission to issue $10,000 in bonds for improvements.

Edwin Andres and Roy Danner, Madison, Ind., are equipping an automobile repair shop.

The Spoon Spark Plug Company, Laporte, Ind., is planning the manufacture of a spark plug. E. E. Weir is general manager.

Schmitt, Berendes & Schmitt, Evansville, Ind., will let contract shortly for the erection of an automobile garage, for which a freight elevator and repair equipment will be needed.

The First Avenue Brick & Tile Company, Evansville, Ind., will spend $20,000 in increasing the capacity of its plant. A new kiln will be erected.

W. H. McCurdy, president of the Hercules Buggy Company, Evansville, Ind., is organizing a new company to manufacture farm tractors.

Klein & Anger are equipping an iron foundry at Madison, Ind. Nicholas Klein is in charge of equipment purchases.

The Pioneer Mfg. Company, Middlebury, Ind., has been incorporated by Charles E. Kauffman with a capital of $25,000 to manufacture steel tanks.

The Banta-Bender Company, Ligonier, Ind., manufacturer of refrigerators, has acquired the plant of the Ligonier Carriage Company, the equipment of which will be improved, particularly with respect to the power plant.

The Grasselli Chemical Company will erect an addition, 160 x 300 ft., at its plant at East Chicago, Ind., and will considerably enlarge its equipment.

The Chambers Fireless Cooker Company, Shelbyville, Ind., has purchased a plant in that city, in which it will conduct its manufacturing operations.

The Owensville Metallic Batten Company, Owensville, Ind., is installing new power plant equipment and extending its manufacturing facilities.

W. E. Burris, Elkhart, Ind., will remodel the former Garden City Tablet Company plant for the Wheat Paper Company, paper manufacturer.

Cleveland

CLEVELAND, OHIO, July 12, 1915.

The demand for machine tools has broadened and continues very active. While inquiries for round lots of machines for making war material are fewer than a few weeks ago, sales of small lots of machines to plants not engaged in making war supplies have increased materially. The demand from the automobile trade at present is very heavy. The Willys-Overland Company, Toledo, Ohio, which is making factory extensions to largely increase its output, has been a large buyer of machine tools the past ten days, it being estimated that its purchases amount close to $250,000. Among new inquiries for machinery for making ammunition is one from the Lake Erie Engine Works, Buffalo, for seventy-five lathes for making shells for Russia. A buyer from Paris was in the city Saturday looking for lathes for early delivery. A Cleveland machine-tool plant which will further increase its capacity because of its heavy volume of business, is figuring on a large amount of additional machine tool equipment. The demand for steam hammers is very active, owing to the fact that forge shops are very busy on war material and automobile work.

The National Tool Company, Cleveland, will enlarge its plant by the erection of a one-story building 60 x 180 ft., to be occupied as a machine shop, hardening department, power plant and storage department. A new steam power plant will be installed. The company will be in the market shortly for a 150-hp. steam engine and boiler. Some additional machine-tool equipment will probably also be installed. The company reports that it is crowded with orders for milling cutters and other products; and it is at present operating its plant night and day.

The Cleveland Metal Products Company, Cleveland, will enlarge its plant by the erection of a two-story office building, 60 x 92 ft. The contract has been placed with the Samuel Austin & Son Company, Cleveland.

The Hill Clutch Company, Cleveland, is making a number of changes in the arrangement of its plant with a view to increasing production, but announces that it contemplates no plant extensions further than the erection of a small building for the shipping department. It reports a very heavy demand for transmission machinery and it is well filled with work in all its departments.

The Lake Erie Smelting & Refining Company, Cleveland, has commenced extensive additions to its copper refining plant. A 10-ton smelter will be installed for reclaiming copper, and a 25-ton blast furnace and ten crucible furnaces. Two buildings, 50 x 75 ft., will be erected, one for the smelting equipment and the other for a new laboratory, offices and a warehouse.

The Toledo-Ford Tire Company, Findlay, Ohio, will enlarge its plant by the erection of an addition, 50 x 130 ft.

The Ohio Engine Company, Sandusky, Ohio, recently formed to manufacture gas engines, has commenced operations in its new quarters in a building formerly occupied by the Sandusky Foundry & Machine Company.

It is announced that the Bauroth Machine & Tool Company, Toledo, will be consolidated with the Webster & Perks Tool Company, Springfield, Ohio. The equipment is being moved to Springfield and will be installed with that of the Webster & Perks Company in Springfield.

The Timken Roller Bearing Company, Canton, Ohio, will take bids shortly for three one-story buildings, each 100 x 300 ft., for its plant extensions.

The Zahner Metal Sash & Door Company, Canton, Ohio, is having plans prepared for a one-story factory building, 100 x 400 ft.

A gray iron foundry will be established in Toledo, Ohio, by Gortland Brothers, who now have plants at Marion and Frankfort, Ind., and at Kankakee, Ill. The site has not yet been definitely selected.

Birmingham

BIRMINGHAM, ALA., July 12, 1915.

Machinery dealers report inquiries from rural dealers as increasing along with a better agricultural business. Gasoline engines are in active demand. More activity in the sawmill trade is indicated.

The Andalusia Packing Company, Andalusia, Ala., has been organized with a capital stock of $125,000 and will build a meat-packing plant.

Guntersville, Ala., has granted a franchise to the Alabama Power Company to construct an electric lighting plant or bring current from its Attalla plant.

Z. M. Maynard, Forsyth, Ga., will establish an electrically-driven ginnery.

The Planters' Ginning Company, Pavo, Ga., has been incorporated by W. A. Mattheis, G. F. Mount, and others, with a capital stock of $6,000, to establish a cotton ginnery, grist mill, etc.

The Farmers' Warehouse Company, Waycross, Ga., will install a ginnery. J. L. Sweat is president.

The R. C. Neeley Company, Waynesboro, Ga., is erecting a ginnery.

J. R. Forbes, Atlanta, will move his broom factory to Macon.

The Douglas Compress Company, Douglas, Ga., will establish a plant at a cost of over $40,000.

The Calhoun Timber Company, Jacksonville, Fla., has been incorporated by Bascom Parker, I. A. Zacharias, and others, with a capital stock of $2,000,000.

St. Petersburg, Fla., has voted to grant a franchise to the St. Petersburg Electric Lighting Company to construct a lighting system.

The Fraser-Purser Company, Commercial Bank Building, Charlotte, N. C., has been incorporated with a capital stock of $50,000 by J. W. Fraser and J. R. Purser. It will act as manufacturers' agents and represents at present the DeLaval Steam Turbine Company, the Wheeler Condenser & Engineering Company, the Bigelow Company, Rumsey & Co., and the Ames Iron Works. J. W. Fraser is president and chief engineer, and J. R. Purser is secretary and sales manager.

The Tar River Oil Company, Tarboro, N. C., is in the market for a second-hand 200-hp. return tubular boiler.

The Newton Oil & Fertilizer Company, Newton, N. C., is in the market for a 25-hp. boiler.

Cincinnati

CINCINNATI, OHIO, July 12, 1915.

The almost unprecedentedly large orders booked by different agencies for high-speed tool steels indicates that shops in this vicinity are operating at more than normal capacity. The automobile manufacturers as well as the machine tool builders are both contracting ahead for tool steels; but in a measure this may be attributed to the fear of a future severe shortage of tungsten. Radial drilling machines are in better demand and stocks of standard sizes have been almost wiped out. Considerable lathe business is still in sight. Shapers show some improvement.

Manufacturers in Columbus, Ohio, report an improvement in conditions, but only a limited number are operating their plants up to capacity. Orders from Spanish-America for different kinds of equipment are increasing both in volume and numbers. No shrapnel or ammunition of any kind is being manufactured in Columbus or in its immediate vicinity. Public work, such as school buildings, etc., is keeping the building contractors busy, and also creating a demand for heating equipment.

In Dayton several manufacturers have large war orders and they are just now getting in good shape for turning these out as fast as was previously estimated.

Work on the new rolling mill of the Tubular Steel Products Company at Reading, Ohio, will be commenced at an early date. The offices of the company will be in Cincinnati. John K. Ewing, Jr., of Pittsburgh, Pa., will be president.

The Bradford Machine Tool Company, Cincinnati, has let contract for an addition to its office building.

The American Foundry & Machine Company, Hamilton, Ohio, is asking for bids on the construction of the proposed addition to its plant to house additional core ovens and sand bins.

The Batavia Milling Machine Company, Batavia, Ohio, has had plans prepared for a brick building, 40 x 100 ft., one story. Equipment will be moved from a building now occupied into the new structure.

E. L. Shuey, Springfield, Ohio, plans to erect another power building to house light manufacturing plants. The proposed structure will be modeled along the lines of the present building now occupied.

The Chicago Metal Products Company, Columbus, Ohio, will soon commence the installation of machinery in its new plant on Cleveland Avenue. The new structure is already under cover and will be completed within two weeks.

The Columbus Suction Company, Columbus, Ohio, has been incorporated with $10,000 capital stock by M. L. Hunnicutt, and others, to manufacture a household specialty.

The Rundle Novelty Company, formerly of Seattle, Wash., will erect a plant in Columbus, Ohio, for the manufacture of children's metal vehicles and other specialties. Information as to the company's plans may be obtained from the Columbus Chamber of Commerce.

The Kyle Mfg. Company, Lancaster, Ohio, has purchased the plant of the Economy Furnace & Heating Company, Wellston, Ohio, and will move the equipment to Lancaster.

West Vienna, Ohio, contemplates additions to its waterworks plnat.

Schenck & Williams, architects, Dayton, Ohio, have completed plans for a five-story light manufacturing building to be constructed for Russell Pryor, Dayton.

The annual outing of employees of the Lodge & Shipley Machine Tool Company, Cincinnati, Ohio, was held at the Harvest Home Park, July 10. There were athletic sports and in the afternoon a dinner was served.

The Central South

LOUISVILLE, KY., July 12, 1915.

Machine tools are probably the most active line at present, both domestic and foreign trade being very brisk. Direct-connected motor-driven tools are reported to be in particularly good call. Wood-working machinery is in demand from plants which are making war supplies, such as gunstocks and aeroplane parts. Although the demand for electrical power equipment is reported to have fallen off sharply the past week, the outlook in most other lines is good. Boiler prospects continue excellent and shops are busier than for some time.

The Ditsler-Wheeler Engine Company, Louisville, has been incorporated with $10,000 capital stock by Peter B. Ditsler, Jeffersonville, Ind., and others. It plans to exploit a patent locomotive attachment. Manufacturing plans have not been made.

The erection of a new roundhouse by the Chesapeake & Ohio Railroad Company at Lexington, Ky., has been begun by the contractors.

The Ford & Matthes Cabinet Works, Paducah, Ky., is considering the purchase of wood-working machinery.

The Perry County Block Coal Company, Lexington, Ky., has been incorporated with $100,000 capital stock and will develop a coal property in Perry County, Ky. A daily capacity of 500 tons will be provided for. R. F. Peters, Hazard, Ky., is in charge of equipment purchases.

The stave mill of H. A. Moss, Cumberland County, Ky., was burned recently with $8,000 loss. Charles Shannon, Glasgow, Ky., has information regarding rebuilding.

The Danville Electric Light & Power Company, Danville, Ky., has installed an oil engine and will make other improvements to its power plant to cost $20,000.

The flour mill of Overby & Wallis and the Penn Garage were burned at Murray, Ky., July 9, with $7,500 loss.

The Stephensburg Stone Company, Stephensburg, Ky., which operates a quarry and crusher, has announced plans for doubling its capacity.

W. S. Mastin, Mount Olivet, Ky., is arranging to equip an automobile garage and repair shop.

The Continental Piston Ring Company, Memphis, Tenn., has been incorporated with $100,000 capital stock by W. P. McCadden, C. B. Bryan, and others.

The Town Creek Milling Company, Lenoir City, Tenn., whose mill was recently burned, has decided to rebuild, and has purchased a site for its mill, which is to cost $50,000. A grain elevator with a capacity of 25,000 bu. will also be equipped.

The Union Motor Car Company, Nashville, Tenn., whose garage and repair shop were recently burned with $20,000 loss, has decided to rebuild.

The John G. Duncan Company, Knoxville, Tenn., is asking for prices on a first-class belt or steam-driven air compressor to deliver 135 to 175 cu. ft. of air per min., with two rotary jack hammer drills. Second-hand equipment is desired.

The City Commission, Chattanooga, Tenn., has decided to equip a machine shop for the repair of fire apparatus, and has authorised the purchase of a motor-driven lathe. Commissioner Betterton may be addressed.

The Ford Motor Company, Detroit, Mich., will build a large assembling plant at Nashville, Tenn. The site for the plant has not yet been selected.

The William J. Oliver Mfg. Company, Knoxville, Tenn., is reported to have secured a large order for the manufacture of shrapnel. L. E. Wooten, vice-president and general manager, has been handling the business.

St. Louis

ST. LOUIS, MO., July 12. 1915.

The St. Louis machine-tool dealers report no marked activity. Industries generally are marking time so far as extensions or new enterprises are concerned, but factories report increases in working forces and no recessions in this respect. Some plants report an intention to work through the summer vacation period, thus indicating an increasing demand for some products which must be filled. Second-hand tools are in some request; but for new tools the chief business is replacement. Money continues easy and rates low, but capital for investment is cautious.

The St. Louis Railway & Dock Company, St. Louis, Mo., has been incorporated with a preliminary capital of $25,000 by W. J. Holbrook, John Hill, D. Arthur Bowman, E. W. Bannister, and others, with plans for the ultimate construction of dock and terminal facilities.

The Arkla Lumber & Mfg. Company, St. Louis, Mo., has been incorporated with a capital stock of $30,000 by Jacob Stassney, Henry A. Singer and J. Milton Wells, and will equip a mill.

The Superior Mfg. & Supply Company, St. Louis. Mo., has been incorporated with a capital stock of $20,000 by L. N. Leonhard, W. E. Dugger, and F. F. Leonhard, to manufacture roofing material, furniture, etc.

The Globe Chemical & Mfg. Company, Kansas City, Mo., has been incorporated with a capital stock of $25,000 by C. D. and L. S. Moore and A. E. Berry, and will equip a plant.

An electric plant to be installed at Bosworth, Mo., will cost about $12,000 and will include one 30-kva., three-phase, 60-cycle, 2300-volt generator, belted, with belt exciter, one 50-hp. oil engine and accessories. Henrici, Kent & Lowry, Kansas City, are the consulting engineers.

The Producers' Refining Company, Kansas City, Mo., which recently increased its capital stock from $600,000 to $800,000, is proceeding with the preparations for increasing its capacity.

The Sheet Metal Products Company, Kansas City, Mo., has been incorporated with a capital stock of $12,000 by John McClelland, C. A. Smith and J. P. Curry and will equip a metal working plant.

The Kansas City-Joplin Mining Company, Joplin, Mo., will install a 110-hp. gas engine in its concentrating plant.

The Greever-Putnam Lumber Company, Harrison, Ark., has been incorporated with a capital stock of $14,000 by H. W. Putnam, Carthage. Mo., M. H. Pierce, and J. V. Greever.

J. Williams, Marshall, Ark., will install equipment for handling and manufacturing marble.

The State Agricultural School, Jonesboro, Ark., will install a central heating and power plant for its various departments.

The Star City Water Company, Star City, Ark., will equip at once a waterworks plant.

The National Concrete Bridge & Culvert Company, Tecumseh, Okla., has been incorporated with a capital stock of $25,000 by E. L. Rosebush and W. C. Furr, Tecumseh, and Sidney Suggs and S. A. Douglass, Ardmore, to manufacture concrete work. Mixers, molds, etc., are wanted.

The Brown Cotton Oil Company, Anadarko, Okla., has been incorporated with a capital stock of $10,000 by A. D. Brown, A. B. Brown, and M. E. Brown.

The Gunsburg-Foreman Company, Buffalo, N. Y., has bought the Ardmore Refinery, Ardmore, Okla., and will add about $175,000 worth of new equipment, increasing the capacity of the plant to 10,000 bbl. daily.

V. K. Sammons, Kansas City, Mo., will erect a garage at 1718 Oak Street, and will install a complete machine shop.

The Sands-Smith Motor Company, Kirksville, Mo., will equip a machine and repair shop, and is in the market for tools. Charles S. Sands is manager.

M. B. Morgan, Morrillton, Ark., has bought the electric plant at Ozark, Ark., and will add equipment to cost about $5,000.

P. E. House, H. S. Trice and J. M. Lowe, Paragould, Ark., will invest about $50,000 in equipping a flourmill, grain elevator, etc.

The J. H. Hamlin & Sons Stave Company, Little Rock, Ark., will install a mill for hardwood lumber at Dallas County, Ark.

An electric railway will be equipped between Hoxie, Ark., and Calico Rock, Ark., by J. A. Gay, Poughkeepsie, Ark., and others. The Arkansas Mining & Development Company is connected with the enterprise.

The commissioners of waterworks district No. 1, Benton, Ark., of which George T. Hughes is chairman, are in the market for equipment.

The E. C. Wehrfritz Machinery Supply Company, Little Rock, Ark., is reported to have suffered a loss of $100,000 from fire recently. A large quantity of machinery was destroyed.

Earl Allen, Ardmore, Okla., will install a 20-in. circular sawmill, a power plant and equipment for manufacturing boxes.

Wellston, Okla., will install a waterworks plant to cost about $20,000. The Benham Engineering Company, Oklahoma City, is consulting engineer.

The Mississippi Fiber Company, Meridian, Miss., has been incorporated with a capital stock of $35,000 by J. G. Daly, C. L. Gray, and others, to manufacture fiber.

Nathan S. Stern of the Stern Foundry & Machinery Company, New Orleans, La., has bought the Southern States Alcohol Company's plant and will install new equipment and operate it.

The city of Gretna, La., will equip a water system to cost about $50,000.

Texas

AUSTIN, TEXAS, July 10, 1915.

With the near approach of the cotton harvest, the demand for ginning, oil mill and compress machinery is growing. Much new elevator machinery is also being installed in order to handle the grain crop. Recent general rains have improved crop conditions.

The People's Gas Company, Mexia, which has been organized with a capital stock of $50,000, will supply towns in Central Texas with natural gas. N. B. Robinson, Mexia, is an incorporator.

The Luling Gin Company, Luling, will build a cotton gin. J. K. Moore is in charge.

The White Hall Gin Company, Navasota, which has a capital stock of $9,000, will build a cotton gin. C. C. Camp is in charge.

The E. B. Chenowith Gin Company, Dallas, has been organized with a captal stock of $15,000 to build a cotton gin. R. W. Blair is in charge.

The Sunset Milling Company, Temple, has been organized with a capital stock of $60,000 by S. A. Lillard, and others.

The Dayton Mills, Dayton, has been organized with a capital stock of $100,000 by A. E. Kerr, and others.

The G. B. R. Smith Milling Company, Sherman, which recently increased its capital stock from $100,000 to $200,000, will make improvements to its flour mill.

The Farmers' Gin Company, Odem, will build a cotton gin to cost $8,000. W. D. Lewis is in charge.

The Missouri, Kansas & Texas Railway Company will enlarge its shops at Smithville. New machinery will be installed.

The Cotton Pickers' Steel Spring Knee Pad Mfg. Company, Austin, has been organized and will build a plant for the manufacture of patent knee pads for cotton pickers. W. R. Holsey is in charge.

The Rotary Flytrap Company, Houston, has been organized to manufacture patent flytraps. L. C. Christian is an organizer.

The Pacific Northwest

SEATTLE, WASH., July 6, 1915.

The mills of the Northwest and Western Washington have received orders and inquiries for lumber products within the past few days from eastern railroad companies that will aggregate 16,000,000 ft. The Chicago & Northwestern Railway has awarded contracts for 10,000,000 ft., while the Chicago, Burlington & Quincy has asked prices on about 6,000,000 ft. The two orders involve about $140,000 and will be used in constructing box cars. It is understood that this is only the beginning of a large business which will be done in this line, as the two roads named have built no wooden cars for more than two years, and it is said they plan to construct 6000 cars this year. Heavy crops and necessity for additional equipment are given as the causes for the new business. The Palmer Lumber & Mfg. Company, Chehalis, Wash., has received a contract for furnishing fir to an Eastern company to construct more than 2000 running boards for automobiles to be shipped to Europe.

Mining machinery continues in brisk demand, with a number of inquiries and several good-sized orders on hand with machinery men in Seattle. In Oregon, eastern Washington and Montana is this condition particularly noticeable, and it is stated by those in touch with mining conditions that 1915 will be the banner year in mining development work in the Northwest.

The large crops expected for the year have caused a good demand for farm implements and several large orders have been booked lately, although most of this business comes in small inquiries. Collections remain about normal. Shipping facilities are still wholly inadequate, but this condition has been eased somewhat by the leasing of a number of vessels in the past two weeks.

Plans for a two-story building for the Enterprise Planing Mill Company, Portland, Ore., have been prepared by Camp & Dupuy, Portland, to replace one recently burned. It will cost about $10,000.

The Irving Canning Company, La Conner, Wash., has been incorporated for $25,000 by G. W. Irving, A. L. Irving and C. O. Cole, and will erect a cannery.

The Franklin Tile & Culvert Company, Billings, Mont., will construct a plant in Miles City, Mont., for the manufacture of cement interlocking culverts. R. F. Fowler, Miles City, is resident representative.

The National Potash & Iodine Company, Bremerton, Wash., of which George W. Miller is president, plans to establish a potash and kelp by-products factory at Alex Bay, on Lopez Island.

The Clearwater Gold & Copper Mining Company, Amador, Mont., plans erecting a new power plant and tramway at its properties.

The Thomas Pulp & Paper Company, Albany, Ore., headed by R. Thomas, has begun the construction of a paper and pulp mill.

The Utah-Idaho Sugar Company, Blackfoot, Idaho, will make improvements to its plant at a cost of $35,000. A pumping plant, to cost $20,000, is among the improvements planned.

The Yellowstone Chemical Company, Miles City, Mont., organized by James G. Ramsey, W. A. Gibb, and others, with a capital stock of $25,000, will erect a plant in that city.

The Anvil Island Brick Company, Vancouver, B. C., will rebuild and re-equip its plant. Plans have been prepared by the Beijzbeek Engineering Company, Portland.

The Post-Lambert Mining Company, Bellingham, Wash., will expend approximately $25,000 in improvements to its properties, including the construction of a sawmill, generator and motor, air compressor, etc.

C. F. Tripp, Council, Idaho, will erect a box factory in that city. Work will start in the near future.

The plant of Cutler Brothers, Hood River, Ore., manufacturers of apple graders, was destroyed by fire recently. Plans are under way for rebuilding.

The Harrison Mining Company, Baker, Ore., will make improvements to the Ben Harrison mine. The work of installing machinery and equipping it will cost at least $100,000. Work will be finished this summer.

The Leona Mills Lumber Company, Leona, Ore., will shortly make extensive improvements to its properties. The plant will have a cutting capacity of 100,000 ft. of lumber every 10 hr.

The sawmill and box factory of Edward Johnson, Brewster, Wash., which was completely destroyed by fire recently, with a loss of $75,000, will be rebuilt.

The W. A. Viggers Iron Works, Portland, Ore., has been incorporated with a capital stock of $15,000 by W. A., L. J. and William Viggers and Frank E. Kenney.

It is reported that W. R. Grace & Co. will soon take bids on the Pacific Coast for the construction of a steel steamer to cost about $800,000, similar to one already built.

Charles R. McCormick & Co., San Francisco, have plans for a lumber schooner to be equipped with twin Bolinder internal-combustion engines of 300 hp. each. The boat will be built at St. Helens, Ore.

The Crown-Willamette Paper Company is preparing to add another unit to its hydroelectric equipment at Oregon City, Ore.

Government Purchases

WASHINGTON, D. C., July 12, 1915.

The supervising architect, Washington, D. C., will receive bids until July 30 for a steam engine and generator with accessories for the Bureau of Mines, Pittsburgh, Pa.

Canada

TORONTO, ONT., July 12, 1915.

McNeil Brothers, New Glasgow, N. S., are in the market for machinery for the manufacture of shells. They will spend $75,000 on the equipment of their plant.

A. E. Chingen's sawmill at Martintown, Ont., was destroyed by fire with a loss of $7,000.

New machinery will be installed in the Canadian Pacific Railway shops at North Bay, Ont., for the manufacture of shells for the Dominion Government.

Bathurst, N. B., will build a power house, boiler house and pumping station. John G. Staut is clerk.

The chairman of the waterworks commission, Ottawa, Ont., will receive bids until Aug. 3 for the supply of high-lift pumps and motors for Lemieux Island. Plans and specifications may be seen at the office of the engineer, R. L. Haycock.

Sackville, N. B., will purchase a new automatic pump for the waterworks plant to cost $3,000. Thomas Murray is clerk.

The Steel Company of Canada will build an addition to its plant at Gananoque, Ont., to cost $3,000. F. B. Cowman is manager.

A. Racine, Ltd., 1967 St. Urbain Street, Montreal, Que., will build a carriage factory.

The George H. King Company, Woodstock, Ont., will install machinery for the manufacture of shells.

Bids will be received by C. G. Marlatt, chairman of the water and light commission, Oakville, Ont., until July 26 for one electrically-operated turbine pump of 600 gal. per min. capacity.

The Canadian Pulp & Lumber Company's mill at Latchford, Ont., was destroyed by fire with a loss of about $50,000.

An explosion at the Canadian Explosives Company's plant at Beloeil, near Montreal, Que., destroyed a large part of the plant and equipment.

The mill of W. M. Sullivan, Redbank, near Newcastle, N. B., was destroyed by fire with a loss of about $40,000.

Weinerman, Osherenko & Sax, Ltd., Toronto, Ont., with a capital stock of $40,000, has been incorporated to manufacture building material, etc., by Harry Weinerman, 29 D'Arcy Street; A. Osherenko, 20 Denison Square, and A. Sax, 24 Bellevue Avenue, Toronto, and others.

The Carmichael Waterproofing Company, Ltd., Toronto, Ont., with a captal stock of $25,000, has been incorporated by Henry Howitt, 44 King Street, West, Toronto; Wilson N. Robinson, Oakville, Ont., and others, to manufacture waterproof products, etc.

The Dominion Lime Company, Ltd., Madoc, Ont., has been incorporated by Stephen Wellington, Charles R. Ross, William H. McBain, and others, of Madoc, Ont., with a capital stock of $100,000, to manufacture brick, stone, cement, etc.

The United Engine & Separator Company of Canada, Ltd., Toronto, Ont., has been incorporated with a capital stock of $50,000 to manufacture engines, implements, concrete mixers, cream separators, etc. The provisional directors are Jeremiah Skelton, 189 Keele Street; George J. Soucy, 1a Bowden Avenue, Toronto, and others.

The J. Cartier et Cie., Lte., Montreal, has been incorporated with a capital stock of $50,000 to construct bridges, buildings, etc. The incorporators are Joseph Cartier, John and J. E. C. Bumbray of Montreal, Que., and others.

Bids are being received by the city clerk, Ottawa, Ont., until Aug. 3 for high-lift pumps and motors, etc. J. B. McRae, Ottawa, is the consulting engineer.

Judicial Decisions

ABSTRACTED BY A. L. H. STREET

ACCIDENT FROM UNEXPLAINED CAUSES.—An employer is not responsible for personal injury to a workman, resulting from breaking of a machine part, if the machine had previously worked properly and gave no evidence of being defective, and if the cause of the breaking is not explained. (New Hampshire Supreme Court, Dingman vs. Merrill, 93 Atlantic Reporter 664.)

WARRANTY OF EFFICIENCY OF BELTING.—When belting sold is warranted to develop certain horsepower if used on certain shafting, but fails to come up to the representation, the buyer is entitled to offset against the agreed price the amount he is damaged in consequence of the breach of warranty. (Delaware Superior Court, E. F. Stoughton & Co. vs. Alpha Process Company, 93 Atlantic Reporter 669.)

ASPECTS OF SALES CONTRACTS.—When a contract to sell goods does not specify any time for payment of the price, and mutual understanding on that point cannot be inferred from the previous course of dealings between the parties, or other circumstances, payment of the price and delivery are due at the same time, and the buyer's failure to tender payment then excuses refusal by the seller to deliver. If there is no express or implied agreement as to the place where delivery is to be made, it will be presumed to have been understood that delivery should be made at the seller's place of business. When goods sold are to be delivered in installments, the buyer's failure to pay for installments already delivered justifies the seller in rescinding the contract as to the remaining deliveries. (Connecticut Supreme Court of Errors, Bridgeport Hardware Mfg. Company vs. Bounoil, 93 Atlantic Reporter 674.)

AUTHORITY OF TRAVELING SALESMEN.—After a written order for goods has been accepted by the concern to which it is addressed, a subsequent verbal agreement between a traveling salesman of the concern and the buyer, modifying the original contract, is not binding upon the concern unless approved by it. (Rhode Island Supreme Court, National Cash Register Company vs. Bramson, 93 Atlantic Reporter 645.)

SALE OF MACHINERY ON APPROVAL.—When machinery is sold on condition that it is delivered on approval, subject to the buyer's right to reject it within a certain period on it proving unsatisfactory, title does not pass until there is a final acceptance directly or impliedly expressed. Until expiration of the trial period, the buyer may return the machinery, without any obligation on account of the agreed price. (New Jersey Court of Errors and Appeals, George A. Ohl & Co. vs. Barnet Leather Company, 93 Atlantic Reporter 715.)

A STATEMENT THAT IS NOT DEFAMATORY.—It is not actionable libel to charge one with having invented a device for use by others in committing an offense against the revenue laws by underweighing imported goods. (New York Court of Appeals, O'Connell vs. Press Publishing Company, 108 Northeastern Reporter, 556.)

EMPLOYEE MUST BE THOUGHTFUL OF OWN SAFETY.—Under the general rule that an employee cannot recover damages for any injury which is due to his own thoughtlessness, a stationary engineer cannot recover for injury to his hand, caused by automatic starting of his engine while he was cleaning it, where he knew that, on account of a leaky throttle valve, the engine was apt to start any time, although the valve was closed and the cylinder cocks were open, and where he unnecessarily placed his hand in a dangerous position on the engine. (Alabama Supreme Court, Reid vs. Sloss-Sheffield Steel & Iron Company, 68 Southern Reporter 136.)

WAIVER OF BREACH OF WARRANTY.—When a contract for sale of machinery contained a clause requiring the buyer to give notice within a certain time after delivery of any defects, defects discovered within that time, but not complained of until three years afterward, and after securing extensions of time for payment of the price on representations that the machinery was satisfactory cannot be relied upon as a defense to suit to recover the balance due on the price. (North Carolina Supreme Court, Frick Company vs. Boles, 84 Southeastern Reporter 1017.)

BINDING QUALITY OF SIGNED CONTRACT.—When one has signed a contract, after full opportunity to read its contents, and without having been defrauded in any manner as to the nature of the contents, he may not avoid its effect by pleading ignorance of its terms. (Kentucky Court of Appeals, United States Talking Machine Company vs. Metcalf, 175 Southwestern Reporter 357.)

MOVING PICTURES AND RIGHT OF PRIVACY.—Although a manufacturer cannot restrain moving picture productions showing the exterior of his plant, with his name displayed thereon, it is an actionable wrong to falsely attribute existence of vice conditions at the plant for which he may reasonably be supposed to be responsible, or to show, to his disadvantage, what purports to be, but is not, an interior view of the plant. (New York Supreme Court, Merle vs. Sociological Research Film Corporation, 152 New York Supplement 829.)

LETTER AS OFFER TO SELL.—A letter stating that the writer has certain goods on hand for which he "wants" a certain price cannot be deemed to be such offer of sale as may be converted into a binding contract by the addressee accepting the terms and ordering shipment, if it is manifest that the letter was merely intended as an invitation of negotiations. This is especially true where the letter states that the writer has "about" a certain quantity of goods for sale. Until there is a definite agreement as to quantity, there can be no valid contract of sale. (Nebraska Supreme Court, Nebraska Seed Company vs. Harsh, 152 Northwestern Reporter 310.)

CORRUPTION OF PURCHASING AGENTS.—When a company's purchasing agent enters into a contract on its behalf to buy goods, under a corrupt agreement whereby he is to receive a commission on the transaction, the company may avoid the contract, by acting promptly on discovering the facts. (United States Circuit Court of Appeals, Eighth Circuit, Ripley vs. Jackson Zinc & Lead Company, 221 Federal Reporter 209.)

GROUND FOR AVOIDING CONTRACT OF PURCHASE.—One who is induced to enter into a contract of sale under misrepresentation that the other party to the agreement is a corporation doing an extensive business may rescind the transaction on discovering that the other party is an individual doing business under a company name. (Maryland Court of Appeals, School Sisters of Notre Dame vs. Kusnitt, 93 Atlantic Reporter 928.)

CONTRACTS WHICH MUST BE IN WRITING.—An order for goods at a price of more than $50 is not binding on the buyer unless acceptance of the order is made by the seller in writing, or there is a partial delivery or payment under the contract. Since the statutes of Michigan require such a contract to be evidenced in writing, there is no mutuality of obligation until both parties have signed the terms which are to bind them. (Michigan Supreme Court, Willebrandt vs. Sisters of Mercy, 152 Southwestern Reporter 85.)

ACCIDENTS FOR WHICH EMPLOYER IS NOT RESPONSIBLE.—Employees of a hoisting machinery company, miscalculating the force required to move a piece of steel plate, it was swung with such force against another plate that the latter was driven from its base, resulting in injury to plaintiff workman. Held, that since the injury was the result of pure accident, the company is not liable in damages. (Pennsylvania Supreme Court, Buckley vs. Brown Hoisting Machinery Company, 93 Atlantic Reporter 825).

SIMULATING COMPETITOR'S PRODUCTS.—Although a manufacturer will be enjoined from putting his products on the market in such form as to strongly tend to deceive the public into believing that in buying his goods they are getting those of another manufacturer who first adopted that form, it is not actionable unfair competition for a manufacturer of pulleys to make and sell repair parts for unpatented pulleys manufactured by another, and to advertise "our sheaves and pins fit

your old blocks," if there is no deception as to the source of manufacture. (Oregon Supreme Court, Columbia Engineering Works vs. Mallory, 147 Pacific Reporter 542).

DESCRIPTIVE TRADEMARKS.—The term "copper-clad," as applied to wire coated with copper, is not subject to exclusive appropriation by a particular manufacturer as part of a trademark, since it is merely descriptive of the form of construction. (United States District Court, Western District of Pennsylvania, Duplex Metals Company vs. Standard Underground Cable Company, 220 Federal Reporter 989.)

RESCINDING PURCHASE OF MACHINERY.—When machinery proves to be deficient under an agreement for its sale, the buyer does not waive his right to rescind his purchase by the mere fact of affording the seller opportunity to correct the defects in the machinery, especially where the seller promises to make it work properly. (Washington Supreme Court, Schroeder vs. Hotel Commercial Company, 147 Pacific Reporter 417.)

NEW TRADE PUBLICATIONS

Pivoted Bucket Carrier.—Gifford-Wood Company, Hudson, N. Y. Bulletin No. 17. Describes and illustrates a pivoted bucket carrier for elevating and conveying coal, ashes, coke, stone, gravel, sand and other materials. The description of the carrier covers the various parts of the system at some length, the text being supplemented by numerous illustrations of the several parts of the bucket. A number of views of plants in which the bucket has been installed are included.

Power Hammers.—Beaudry & Co., Inc., 141 Milk Street, Boston, Mass. Booklet. Pertains to a line of power hammers, designed for either belt or motor drive. The fields covered by the two different types of hammers are briefly discussed, after which both hammers are illustrated and described at some length, the text being supplemented by a number of engravings of the various parts. Specification tables of both types of hammers are included. Mention is made of the friction clutch used on the motor-driven hammer. An illustrated description of this clutch appeared in THE IRON AGE, Dec. 1, 1914.

Special Forgings.—Richard Eccles Company, Auburn, N. Y. Catalog. Shows an extensive line of special automobile forgings. There is practically no text in the catalog, which is composed almost entirely of dimensioned drawings of various special forgings. In the case of spring clips the different patterns are illustrated with tables of the sizes in which they can be supplied. Mention is also made of a general line of small forgings.

Reinforced Concrete Chimneys.—Weber Chimney Company, 1452 McCormick Building, Chicago, Ill. Catalog No. 10. Calls attention to a line of reinforced concrete chimneys for use with boilers of various types, heating and ventilating, smelting purposes, malleable iron and glass furnaces, incinerators, etc. After a brief description of the construction of the chimneys, their advantages, etc., a number of engravings of chimneys that have been installed are presented. A partial list of plants where these chimneys have been erected is included, both the height and internal diameter being given in each case.

Locomotive Cranes and Grab Buckets.—Orton & Steinbrenner Company, Chicago, Ill. Catalog No. 11. Size 6 x 9 in.; pages, 43. Illustrates the different types of locomotive cranes built for every variety of service. Views are also shown of the standard V-clamshell bucket, a scraper type with wide spread and the orange peel design. A general statement of the specifications according to which the equipment is built introduces the illustrations.

Power Transmission Machinery.—Mesta Machine Company, Pittsburgh, Pa. Bulletin Ka. Contains a horsepower chart for determining the variables for rotating parts transmitting power, such as gears, pulleys, rope wheels, etc. The use of this chart enables the pitch diameter and the pitch load to be determined when the power to be transmitted, pitchspeed, and number of revolutions are known.

Derricks.—Dobbie Foundry & Machine Company, Niagara Falls, N. Y. Catalog No. 18. Concerned with a line of derricks and fittings for use by contractors and quarrymen. The derricks are intended for hand, power, or horse operation and all of the different styles are illustrated, the engravings in practically every instance showing actual installations except in the case of some of the smaller types. A special feature of the steel derrick is the sectional construction which enables the derrick to be dismantled and shipped on a single flat car. Specification tables for the various derricks are included, and a complete line of fittings for the derricks is illustrated.

Lathes.—Flather & Co., Inc., Nashua, N. H. Collection of circulars. Cover a line of lathes including the quick change gear and engine types for motor drive. The lathes covered range from 13 to 26 in. in swing, a separate circular as a rule being given to each size and style. In the circulars a view of the tool is given, with a description covering the principal points and a condensed table of specifications is included.

Pipe and Fittings.—National Tube Company, Frick Building, Pittsburgh, Pa. Catalog J. Size, 5 x 7¾ in.; pages, 434. Supersedes all previous catalogs and describes principally by illustrations and specification tables the material manufactured at the Kewanee works of this company. The material covered by the catalog includes pipes for steam, gas, water, and air; cast and malleable iron and brass fittings, unions, brass and iron body valves and cocks, radiators and coils, drive well points and well supplies. A comprehensive index of the products occupies thirty-six pages, and in addition to listing the material described indicates other lines which can be supplied. A list of the products and publications of the company is also presented. The catalog is divided into twelve sections, each dealing with some particular line, and in all of them the engravings are relied upon to tell the story, there being practically no text description. In a number of cases dimensions, diagrams and tables supplement the regular illustrations of the particular parts.

Drilling Machines.—W. H. Leland & Co., Worcester, Mass. Collection of circulars. Give illustrations and brief descriptions of a line of sensitive drilling machines ranging from one up to eight spindles. The construction and operation of the machines are gone into at some length, and this is followed by individual bulletins, each dealing with some particular machine. Mention is made of the special tapping head for use on the machines and instructions on the proper way to put the belts on the machines are included. Reference is made to the tests which the machines undergo before shipment and a copy of the inspection sheet that goes with every machine is reproduced.

Pumps.—Blakeslee Mfg. Company, Du Quoin, Ill. Catalog No. 20. Relates to a line of single-cylinder steam pumps without valve gears, vacuum pumps, air compressors, duplex steam, and jet and bilge pumps. An engraving of each line of pumps and a brief statement of what is typical of all is followed by brief descriptions and tables of specifications. The uses that are made of the pumps are briefly touched upon and a number of tables of useful information are included.

Tanks.—Walter A. Zelnicker Supply Company, St. Louis, Mo. Bulletin No. 173. Relates to the various sizes and styles of tanks, both new and second-hand, that are ordinarily carried in stock. In addition to giving the dimensions and capacity, brief notes of the purposes for which the tanks can be used are given.

Slotting Machines.—Newton Machine Tool Works, Inc., Twenty-third and Vine Streets, Philadelphia, Pa. Catalog No. 49. Deals with a line of standard and special slotting machines, the smaller sizes of which are crank-driven, while the larger are driven by screw or by rack and pinion. A brief description of the construction of the machines, together with the various driving arrangements that can be supplied is first given, followed by engravings of the several machines, with brief specification tables. Views of a number of different designs of milling, boring, drilling and cold saw cutting off machines are included.

Fire Hydrants and Valves.—Roe Stephens Mfg. Company, Detroit, Mich. Catalog G. Treats of compression and gate fire hydrants for use in municipal water supply systems and fire protection systems for industrial plants. The advantages of the compression hydrant are briefly touched upon and instructions for installing it given. Sectional views of the hydrants are presented and mention is made of accessories such as water gates, valve boxes, indicator posts, sluice gates, valves, etc.

Steam Locomotives for Industrial Plants.—H. K. Porter Company, Union Bank Building, Pittsburgh, Pa. Catalog. Shows 673 locomotives of various sizes and types for use in industrial plants. Specification tables are given for the different sizes of each general type, and following these engravings and specification tables, the classification of the different locomotives are given, with specifications for the various materials used in their construction. The second part of the catalog is given over to engineering information, tables and formulæ. A section of useful information is also included, together with a complete telegraphic code. A number of views of the shop in which the locomotives are built are presented.